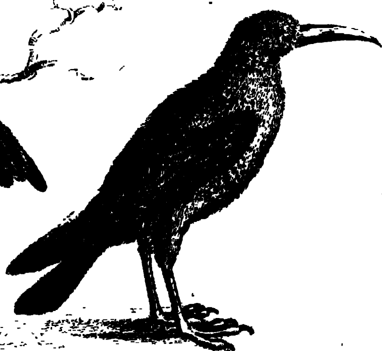








1. *Impeyan Pheasant* _2. *Crested Curasso*
3. *Garrulous Roller* _ 4. *Cornish Chough*

BUFFON'S
Natural History
ABRIDGED.
A New Edition
By the Revd. W. Hutton, M.A.
Embellish'd with
100, ENGRAVINGS.
in 2 Volumes
Vol. II.



(London.)
Printed for the Editor & Sold by T. Tegg, Cheapside;
& R. Griffin & Co. Glasgow.

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BUFFON's

NATURAL HISTORY.

PART II



CHAPTER I.*

Of Birds in General—Of the Struthious, or Ostrich Order —The OSTRICH—*The Touyou—The* CASSOWARY—*The* DODO—*The Solitary and the Nazarene—Of rapacious Birds—The Golden* EAGLE—*Different Species of Eagles—The Osprey, &c.—The Condor—The* VULTURE—*The different Species of Vultures—The King Vulture, the Secretary, &c.—The* FALCON—*Description of the Art of Falconry—Species of Falcons and other Hawks—The Kite—The Buzzard—The* SHRIKE, *or Butcher-bird—The* OWL—*Species of the Owl.*

QUADRUPEDS in their general structure have much relation with that of man; but the structure of birds is in most respects entirely dissimilar from both. One obvious mark of distinction between this class of animals and the quadruped part of the creation is, that instead of hair, birds are covered with feathers, and these appear to be nourished and kept in order in a different manner from the hair of animals. Lest the feathers should spoil by

* In the following account of birds, they are classed agreeably to the scientific arrangement of *orders*, *genera*, and *species*. In the contents of the chapters, therefore, the genus is distinguished by capitals, and the different species which are described are printed in Italics.

exposure to the air, the bird is furnished with a gland situated on the rump of the animal, containing a proper quantity of oil, which it presses out with its beak, and occasionally anoints its feathers. In water-fowl this oil is so plentiful that it even imparts a degree of rancidity to the flesh, and we see that their coat of feathers is rendered by it completely water-proof.

The wings of birds are remarkably strong. The flap of a swan's wing would break a man's leg, and a similar blow from an eagle has been known to lay a man dead in an instant.

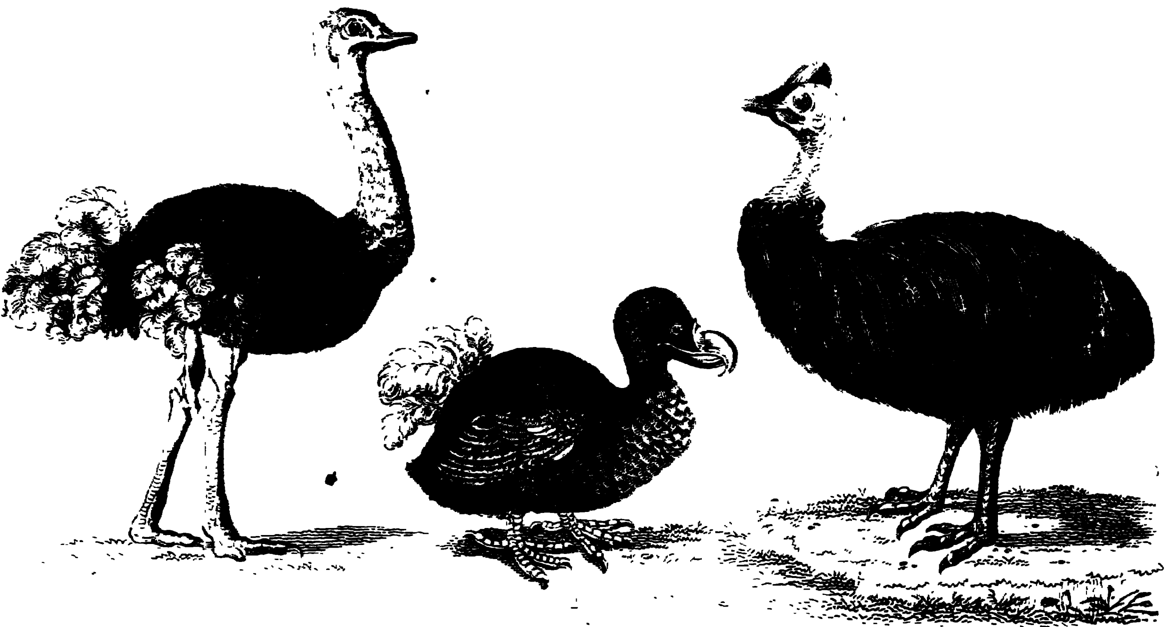
The sense of seeing in birds is remarkably acute, and though they have no external ear, but only two small orifices or ear-holes, yet they do not appear to be deficient in hearing. The scent of some species is exquisitely delicate. In decoys, where ducks are caught, the men who attend them generally keep a piece of turf lighted, on which they breathe, lest the fowl should smell them and fly away. The voice of birds is much louder in proportion to their size than that of other animals, for in fact, the bellowing of an ox is not louder than the scream of a peacock.

The legs, the wings, the bones, and every part of the body, are much lighter, firmer, and more compact in birds than in other creatures. Their lungs are extended all over the cavity of their body.

Carnivorous birds, like carnivorous quadrupeds, have but one stomach, and that well calculated for digestion. Those that feed on grain have, in addition to the crop or stomach, where their food is moistened or swelled, a gizzard, which is a very hard muscle, almost cartilaginous or gristly, and which they commonly fill with small stones, where the food is afterwards ground, in order to its complete digestion. Birds are subject to few diseases.

Birds of the same species do not always make their nests of the same materials, though in general there is a uniformity; the red-breast in some parts of England makes its nest with oak leaves where those leaves are plenty, in other parts it makes it with moss and hair. Where the eggs are numerous, it is necessary to make the nest warm; thus the wren, which is a small animal, and able to cover but a small compass, and yet lays many eggs, makes her nest remarkably warm; on the contrary the plover, the eagle, the crow, &c. which lay but two or three, are not equally solicitous in this respect.

There are some birds which are called birds of passage,



and which by migrating make an habitation in all parts of the earth; but in general every climate has birds peculiar to itself. In all countries birds are much longer lived than quadrupeds. The swan is said to live near three hundred years. They are however greatly inferior to quadrupeds in sense and docility.

As the number of species in this order of animals is very numerous, amounting to above eight hundred, some degree of classification appears to be absolutely necessary. We shall therefore arrange them in eight orders. The first will include the few birds which there are of the struthious, or ostrich order, or those which never rise from the earth. The second consists of the rapacious birds; the third is the gallinaceous, or poultry order, at the conclusion of which that which some authors have termed the columbine order, or the pigeon, and its varieties, is introduced; the fifth includes the pies; the sixth the passerine, or sparrow kind; the seventh the cloven-footed water-fowl, including those with pinnated feet; and the eighth the web-footed water-fowl.*

Of BIRDS *of the Struthious Order.*

THE OSTRICH is a bird very anciently known, since it is mentioned in the oldest of books. It has furnished the sacred writers with some of their most beautiful imagery, and its flesh was, even previous to the days of Moses, apparently a common species of food, since we find it interdicted among other unclean animals by the Jewish legislator.

The ostrich is generally considered as the largest of birds, but its size serves to deprive it of the principal excellence of this class of animals, the power of flying. The medium weight of this bird may be estimated at seventy-five or eighty pounds, a weight which would require an immense power of wing to elevate into the atmosphere; and hence all those of the feathered kind which approach to the size of the ostrich, such as the touyou, the cassowary, the dodo neither possess, nor can possess the faculty of flight. The head and bill of the ostrich somewhat resemble those of a duck; and the neck may be compared to that of a swan, but that it is much longer; the legs and thighs resemble those of a hen; though the whole appearance at a distance

* This arrangement is perfectly agreeable to that of our author, M. de Buffon, except that we have placed the struthious order first, as being most considerable in magnitude and importance. Editor.

bears a strong resemblance to that of a camel, it is usually seven feet high from the top of the head to the ground; but from the back it is only four; so that the head and neck are above three feet long. From the top of the head to the rump, when the neck is stretched out in a right line, it is six feet long, and the tail is about a foot more. One of the wings, without the feathers, is a foot and a half; and being stretched out, with the feathers, is three feet.

The plumage is much alike in all; that is, generally black and white; though some of them are said to be grey. The greatest feathers are at the extremities of the wings and tail, and the largest are generally white. The next row is black and white; and of the small feathers, on the back and belly, some are white and others black. There are no feathers on the sides, nor yet on the thighs, nor under the wings. The lower part of the neck, about half way, is covered with still smaller feathers than those on the belly and back; and those, like the former, also are of different colours. The head and upper part of the neck are covered with hair.

At the end of each wing there is a kind of spur, almost like the quill of a porcupine. It is an inch long, being hollow, and of a horny substance. There are two of these on each wing; the largest of which is at the extremity of the bone of the wing, and the other a foot lower. The neck seems to be more slender in proportion to that of other birds, from its not being furnished with feathers.

The thighs are very fleshy and large, being covered with a white skin, inclining to redness, and wrinkled in the manner of a net, whose meshes will admit the end of a finger. Some have very small feathers here and there on the thighs; and others again have neither feathers nor wrinkles. The legs are covered before with large scales. The end of the foot is cloven, and has two very large toes, which, like the leg, are covered with scales. These toes are of equal sizes. The largest, which is on the inside, is seven inches long, including the claw, which is near three-fourths of an inch in length, and almost as broad. The other toe is but four inches long, and is without a claw.

The ostrich is a native only of the torrid regions of Africa, and has never bred out of that country which first produced it. Though, however, the climate of France be much less warm than that of Barbary, yet some ostriches have been known to lay in the royal menagerie at Ver-

sailles; but the gentlemen of the Academy have in vain attempted to make these eggs produce by an artificial process. This bird, so disqualified for society with man, inhabits, from preference, the most solitary and horrid deserts, where there are few vegetables to clothe the surface of the earth, and where the rain never comes to refresh it. The Arabians assert that the ostrich never drinks; and the place of its habitation seems to confirm the assertion. In these formidable regions ostriches are seen in large flocks, which, to the distant spectator, appear like a regiment of cavalry, and have often alarmed a whole caravan. There is no desert, how barren soever, but is capable of supplying these animals with provision; they eat almost every thing; and these barren tracts are thus doubly grateful as they afford both food and security. The ostrich is of all animals the most voracious. It will devour leather, grass, hair, iron, stones, or any thing that is given. Nor are its powers of digestion less in such things as are digestible. Those substances which the coats of the stomach cannot soften, pass whole; so that glass, stones, or iron, are excluded in the form in which they are devoured. All metals indeed, which are swallowed by any animal, lose a part of their weight, and often the extremities of their figure, from the action of the juices of the stomach upon their surface. A quarter pistole, which was swallowed by a duck, lost seven grains of its weight in the gizzard before it was voided; and it is probable that a still greater diminution of weight would happen in the stomach of an ostrich; considered in this light, therefore, this animal may be said to digest iron; but such substances seldom remain long enough in the stomach of any animal to undergo so tedious a dissolution. The ostrich lays very large eggs, some of them being above five inches in diameter, and weighing above fifteen pounds. These eggs have a very hard shell, somewhat resembling those of the crocodile, except that those of the latter are less and rounder.

The season for laying depends on the climate; in the northern parts of Africa it is about the beginning of July; in the south, it is about the latter end of December. These birds are very prolific, and lay generally from thirty tc forty eggs in a season, and about twelve at one clutch. It has been commonly reported that the female deposits them in the sand; and covering them up, leaves them to be hatched by the heat of the climate, and then permits the young to shift for themselves. Very little of this how-

ever is true: no bird has a stronger affection for her young than the ostrich, and none watches her eggs with greater assiduity. It happens, indeed, in those hot climates, that there is less necessity for the continual incubation of the female; and she more frequently leaves her eggs, which are in no fear of being chilled by the weather: but though she sometimes forsakes them by day, she always carefully broods over them by night; nor is it more true that they forsake their young after they are excluded the shell. On the contrary, the young ones are not even able to walk for several days after they are hatched. During this time the old ones are very assiduous in supplying them with grass, and very careful to defend them from danger: nay, they encounter every danger in their defence.

The strength and size of the ostrich has suggested to men the experiment of using them as animals of burthen. The tyrant Firmius, who reigned in Egypt about the end of the third century, was frequently carried by large ostriches. Moore, an English traveller, relates, that he had seen at Joar, in Africa, a man travelling on an ostrich. And Vallisnieri speaks of a young man, who exhibited himself upon one of these birds at Venice. In fine, M. Adanson saw at the factory at Podor, two ostriches, which were yet young, of which the stronger went at a pace which would have distanced the fleetest English race-horse, with two negroes on its back. Whether this bird could be broken and tamed so as to carry its rider with the same safety and docility as a horse is a different question; and let it be remembered, that though the ostriches above-mentioned ran for a short time faster than a race-horse, there is no reason to believe they could hold out so long.

From ancient writers we learn, that whole nations have acquired the name of Struthophagi (ostrich eaters) from the preference which they had manifested for the flesh of this bird. Apicius has recommended a peculiar sauce for the ostrich, which shews at least that it was eaten among the Romans, and at a single feast the Emperor Heliogabalus was served with the brains of *six hundred* of these animals. Even at this period some of the savage nations of Africa hunt them not only for their plumage, but for their flesh also, which they consider as a dainty. They sometimes also breed these birds tame, to eat the young ones, of which the female is said to be the greatest delicacy; and a single egg is said to be a sufficient entertain-

ment for eight men. The skin of the ostrich is so thick, that it is used for leather by the Arabians; and of the eggs drinking-cups are made. The value of the plumage is well known in most countries of Europe.

As the spoils of the ostrich are thus valuable, it is not to be wondered at that man has become their most assiduous pursuer. For this purpose, the Arabians train up their best and fleetest horses, and hunt the ostrich still in view. Perhaps, of all varieties of the chase, this, though the most laborious, is yet the most entertaining. As soon as the hunter comes within sight of his prey, he puts on his horse with a gentle gallop, so as to keep the ostrich still in sight; yet not so as to terrify him from the plain into the mountains. Upon observing himself, therefore, pursued at a distance, the bird begins to run at first, but gently; either insensible of his danger, or sure of escaping. In this situation he somewhat resembles a man at full speed; his wings, like two arms, keep working with a motion correspondent to that of his legs; and his speed would very soon snatch him from the view of his pursuers, but, unfortunately for the silly creature, instead of going off in a direct line, he takes his course in circles; while the hunters still make a small course within, relieve each other, meet him at unexpected turns, and keep him thus still employed, still followed for two or three days together. At last, spent with fatigue and famine, and finding all power of escape impossible, he endeavours to hide himself from those enemies he cannot avoid, and covers his head in the sand, or the first thicket he meets. Sometimes, however, he attempts to face his pursuers: and though, in general, the most gentle animal in nature, when driven in desperation, he defends himself with his beak, his wings, and his feet. Such is the force of his motion, that a man would be utterly unable to withstand him in the shock.

The Struthophagi had another mode of capturing these animals. They disguised themselves in the skin of an ostrich, and putting one of their arms through the neck, they imitated all its motions. By this means they are said to have enabled themselves to approach and take them at pleasure. In the same manner the savages of America disguise themselves as a roe-buck, in order to surprise that animal.

The *Touyou*, which many call the American ostrich, is not an ostrich, though the travellers who have mentioned

it, seem to have been more solicitous of proving the affinity to that animal, than of describing those peculiarities which distinguish it from all others of the feathered creation.

It is chiefly found in Guiana, along the banks of the Oroonoko, in the inland provinces of Brazil and Chili, and the vast forests that border on the mouth of the river Plata. Many other parts of South America were known to have them; but as man multiplied, these large and timorous birds either fell beneath their superior power, or fled from their vicinity.

The touyou, though not so large as the ostrich, is only second to it in magnitude. It is by much the largest bird in the New Continent; and is generally found to be six feet high, measuring from its head to the ground. Its legs are three feet long; and its thigh is nearly as thick as that of a man. Its body is of an oval form, and appears entirely round. It is covered from the back and rump with long feathers; these feathers are grey upon the back, and white on the belly, and it has no other tail. It goes very swiftly, and seems assisted in its motion by a kind of tubercle behind, like a heel, upon which, on plain ground, it treads very securely: in its course it uses a very odd kind of action, lifting up one wing, which it keeps elevated for a time; till letting it drop, it lifts up the other: it runs with such swiftness, that the fleetest dogs are thrown out in the pursuit. One of them finding itself surrounded by the hunters, darted among the dogs with such fury, that they made way to avoid its rage; and it escaped, by its amazing velocity, in safety to the mountains.

Nieremberg relates, that during incubation, they generally make a false nest at some distance from the true one; in this they lay two eggs, which are afterwards broken by the old bird, and by attracting a number of flies, beetles, &c. afford a means of sustenance to the young.

When first hatched, the young ones are familiar, and follow the first person they meet. I have been followed myself, says Wafer, by many of these young ostriches; which at first are extremely harmless and simple: but as they grow older, they become more cunning and distrustful; and run so swift, that a greyhound can scarcely overtake them. Their flesh, in general, is good to be eaten; especially if they are young. It would be no difficult matter to rear up flocks of these animals tame, particularly as they are naturally so familiar: and they might be found

to answer domestic purposes, like the hen or the turkey. Their maintenance could not be expensive, if, as Narborough says, they live entirely upon grass.

The Cassowary is a bird which was first brought into Europe by the Dutch, from Java, in the East Indies, in which part of the world it is only to be found.

The cassowary, though not so large as the former, yet appears more bulky to the eye; its body being nearly equal, and its neck and legs much thicker and stronger in proportion; this conformation gives it an air of strength and force, which the fierceness and singularity of its countenance conspire to render formidable. That which has been described by the gentlemen of the Academy was five feet and a half from the point of the bill to the extremity of the claws; and the legs were two feet and a half high, from the belly to the end of the back. In other birds, a part of the feathers serve for flight, and are different from those that serve for mere covering; but in the cassowary, all the feathers are of the same kind, and outwardly of the same colour. They are generally double; having two long shafts, growing out of a short one, which is fixed in the skin. The beards that adorn the stem or shaft, are about half way to the end, very long, and as thick as an horse-hair, without being subdivided into fibres. The stem or shaft is flat, shining, black, and knotted below; and from each knot there proceeds a beard: likewise, the beards at the end of the large feathers are perfectly black; and towards the root of a grey tawny colour; shorter, more soft, and throwing out fine fibres, like down: so that nothing appears except the ends, which are hard and black; because the other part, composed of down, is quite covered. There are feathers on the head and neck; but they are so short, and thinly sown, that the bird's skin appears naked, except towards the hinder part of the head, where they are a little longer. The wings, when they are deprived of their feathers, are but three inches long. The ends of the wings are adorned with five prickles, of different lengths and thicknesses, which bend like a bow: these are hollow from the roots to the very points, having only that slight substance within, which all quills are known to have. The longest of these prickles is eleven inches; and it is a quarter of an inch in diameter at the root, being thicker than towards the extremity; the point seems broken off.

The part, however, which most distinguishes this animal

is the head; this, though small, like that of an ostrich, does not fail to inspire some degree of terror. It is bare of feathers, and is in a manner armed with an helmet of horny substance, that covers it from the root of the bill to nearly half the head backwards. This helmet is black before and yellow behind. Its substance is very hard, being formed by the elevation of the bone of the skull: and it consists of several plates, one over another, like the horn of an ox. Some have supposed that this was shed every year with the feathers; but the most probable opinion is, that it exfoliates slowly like the beak. To the peculiar oddity of this natural armour may be added the colour of the eye in this animal, which is a bright yellow, and the globe being above an inch and a half in diameter, gives it an air equally fierce and extraordinary. At the bottom of the upper eye-lid, there is a row of small hairs, over which there is another row of black hair, which look pretty much like an eye-brow. The sides of the head, about the eye and ear, being destitute of any covering, are blue, except the middle of the lower eye-lid, which is white. The neck is of a violet colour, inclining to that of slate: and it is red behind in several places, but chiefly in the middle. About the middle of the neck before, at the rise of the large feathers, there are two projections formed by the skin, which resemble somewhat the gills of a cock, but that they are blue as well as red. The skin which covers the fore part of the breast, on which this bird leans and rests, is hard, callous, and without feathers. The thighs and legs are covered with feathers, and are extremely thick, strong, and straight; but the legs are thicker a little above the foot than in any other place. The toes are covered with scales, and are but three in number; for that which could be behind is wanting.

Thus formed for a life of hostility, for terrifying others, and for its own defence, it might be expected that the cassowary was one of the most fierce and terrible animals of the creation. But nothing is so opposite to its natural character, nothing so different from the life it is contented to lead. It never attacks others; and instead of the bill, when attacked, it rather makes use of its legs, and kicks like an horse, or runs against his pursuer, beats him down, and treads him to the ground.

The manner of going of this animal is not less extraordinary than its appearance. Instead of going directly forward, it seems to kick up behind with one leg, and then making a bound onward with the other, it goes with such prodigious velocity, that the swiftest racer would be left far behind.

The same degree of voraciousness which we perceived in

the ostrich, obtains as strongly here. The cassowary swallows every thing that comes within the capacity of its gullet. The Dutch assert, that it can devour not only glass, iron, and stones, but even live on burning coals, without testifying the smallest fear, or feeling the least injury. It is said that the passage of the food through its gullet is performed so speedily, that even the very eggs which it has swallowed whole, pass through it unbroken, in the same form they went down. The cassowary's eggs are of a grey ash colour, inclining to green. The largest is found to be fifteen inches round one way, and about twelve the other. The voice of this bird resembles the grunting of a hog.

The southern parts of the most eastern Indies seem to be the natural climate of the cassowary. His domain, if we may so call it, begins where that of the ostrich terminates. The latter has never been found beyond the Ganges: while the cassowary is never seen nearer than the islands of Banda, Sumatra, Java, the Molucca Islands, and the corresponding parts of the continent.

THE DODO. Swiftness is generally considered as the peculiar attribute of birds, but the dodo, instead of exciting that idea by its appearance, seems to strike the imagination as a thing the most unwieldy and inactive of all nature. Its body is massive, almost cubical, and covered with grey feathers: it is just barely supported upon two short thick legs like pillars. The neck, thick and pursy, is joined to the head, which consists of two great chaps, that open far behind the eyes, which are large, black, and prominent; so that the animal, when it gapes, seems to be all mouth. The bill, therefore, is of an extraordinary length, not flat and broad, but thick, and of a bluish white, sharp at the end, and each chap crooked in opposite directions. From all this results a stupid and voracious physiognomy; which is still more encreased by a bordering of feathers round the root of the beak, and which give the appearance of a hood or cowl. The dodo is furnished with wings, covered with soft ash-coloured feathers, but they are too short to assist it in flying. It is furnished with a tail, and with a few small curled feathers; but this tail is disproportioned and displaced. Its legs are too short for running, and its body too fat to be strong.

This bird is a native of the Isle of France; and the Dutch, who first discovered it there, called it in their language the *nauseous bird*, as well from its disgusting figure, as from the bad taste of its flesh. However, succeeding

observers contradict this last report, and assert that its flesh is good and wholesome eating. It is a simple bird, and is very easily taken. Three or four dodos are enough to dine an hundred men.

THE SOLITARY, AND THE NAZARENE. The first of these is a large bird, which inhabits the Isle of Roderique, and receives its name from its solitary habits, scarcely more than two being ever found together. The male is said to weigh sometimes forty-five pounds. It has some relation to the turkey, but its bill is more bent, and it stands higher on its legs than that bird. The colour of its plumage is grey and brown mixed, and it has scarcely any tail. The wings are too short for flight, and the bone of the pinion swells out into a kind of round knob. The females are sometimes covered with light yellow feathers, and they have also a widow's peak above the bill. They lay only one egg, and sit seven weeks. It is said that a stone is always found in the gizzard both of this bird and the dodo; it is, however, probably only of the same kind, and for the same purpose, as those which are found in all granivorous birds, and serves merely to prove them of that kind. They are hunted from March to September, and being then very fat, the young ones are much esteemed as food.

The NAZARENE is found at present in the Isle of France, though it evidently takes its name from having been originally a native of the Isle of Nazareth. It is larger than the swan, with the bill bent a little downwards. Instead of feathers, it is covered with black down; but the wings are feathered, and there are some frizzled feathers on the rump. The legs are scaly, with three toes to each foot. The female lays but one egg.

Both these last mentioned birds have much affinity with the dodo, if indeed they be any more than simple varieties.

Of rapacious Birds

THE GOLDEN EAGLE is the largest and noblest of all those birds that have received the name of eagle. The length of the female is three feet and a half; the extent of its wings, eight and a half; it weighs from sixteen to eighteen pounds; but the male seldom weighs more than twelve pounds.* Its bill is three inches long, and of a deep blue; and the

* Among the birds of prey the female is generally larger than the male.



1. Golden Eagle 2. Great Vulture 3. Secretary

eye of a very brilliant hazel colour. The sight and sense of smelling are very acute. The head and neck are clothed with narrow, sharp pointed feathers, of a deep brown colour, bordered with tawny; but those on the crown of the head, in very old birds, turn grey. The whole body, above as well as beneath, is of a dark brown; and the feathers of the back are finely clouded with a deeper shade of the same. The wings when clothed reach to the end of the tail. The quill feathers are of a chocolate colour, the shafts white. The tail is of a deep brown, irregularly barred and blotched with an obscure ash-colour, and usually white at the roots of the feathers. The legs are yellow, short, and very strong, being three inches in circumference, and feathered to the very feet. The toes are covered with large scales, and armed with the most formidable claws, the middle of which are two inches long.

In the rear of this terrible bird follow the *ring-tailed eagle*, the *common eagle*, the *bald eagle*, the *white eagle*, the *rough-footed eagle*, the *erne*, the *black eagle*, *the osprey*, the *sea eagle*, the *crowned eagle*, *&c.* These, and others that might be added, form different shades in this fierce family; but have all the same rapacity, the same general form, the same habits, and the same manner of bringing up their young.

In general, these birds are found in the mountainous and ill-peopled countries, and breed among the loftiest cliffs. They choose those places which are remotest from man, upon whose possessions they but seldom make their depredations, being contented rather to follow the wild game in the forest, than to risk their safety to satisfy their hunger.

It requires great patience and much art to tame an eagle, and even though taken young, and brought under by long assiduity, yet still it is a dangerous domestic, and often turns its force against its master. When brought into the field for the purposes of fowling, the falconer is never sure of its attachment: the innate pride, and love of liberty, still prompt it to regain its native solitudes; and the moment the falconer sees it, when let loose, first stoop towards the ground, and then rise perpendicularly into the clouds, he gives up all his former labour for lost; quite sure of never beholding his late prisoner more. Sometimes, however, they are brought to have an attachment for their feeder; they are then highly serviceable, and liberally provide for his pleasures and support. When the falconer lets them go from his hand, they play about and hover round him till their game presents, which they see at an immense distance, and pursue with certain destruction.

Of all animals the eagle flies highest, and on this account he was called by the ancients the bird of Jove. Of all birds, also, he has the quickest eye; but his sense of smelling is far inferior to that of the vulture. He never pursues, therefore, but in sight: and when he has seized his prey, he stoops from his height, as if to examine its weight, always laying it on the ground before he carries it off. As his wing is very powerful, yet, as he has but little suppleness in the joints of the leg, he finds it difficult to rise when down; however, if not instantly pursued, he finds no difficulty in carrying off geese and cranes. He also carries away hares, lambs, and kids: and often destroys fawns and calves, to drink their blood, and carries a part of their flesh to his retreat. Infants themselves, when left unattended, have been destroyed by these rapacious creatures; which probably gave rise to the fable of Ganymede's being snatched up by an eagle to heaven.

An instance is recorded in Scotland of two children being carried off by eagles: but fortunately they received no hurt by the way; and, the eagles being pursued, the children were restored unhurt out of the nests to the affrighted parents.

The eagle is thus at all times a formidable neighbour; but peculiarly so when bringing up its young. It is then that the female, as well as the male, exert all their force and industry to supply their young. Smith, in his History of Kerry, relates, that a poor man in that country got a comfortable subsistence for his family, during a summer of famine, out of an eagle's nest, by robbing the eaglets of food, which were plentifully supplied by the old ones. He protracted their assiduity beyond the usual time, by clipping the wings, and retarding the flight of the young.

It happened some time ago, in the same country, that a peasant resolved to rob the nest of an eagle, that had built in a small island, in the beautiful lake of Killarney. He accordingly stripped and swam in upon the island, while the old ones were away: and, robbing the nest of its young, he was preparing to swim back, with the eaglets tied in a string; but, while he was yet up to his chin in the water, the old eagles returned, and, missing their young, quickly fell upon the plunderer, and, in spite of all his resistance, dispatched him with their beaks and talons.

In order to extirpate these pernicious birds, there is a law in the Orkney Islands, which entitles any person that kills an eagle to a hen out of every house in the parish in which the plunderer is killed.

The nest of the eagle is usually built in the most inaccessible cliff of the rock, aud often shielded from the weather by some jutting cragg that hangs over it. Sometimes,

however, it is wholly exposed to the winds, as well sideways as above; for the nest is flat, though built with great labour. It is said that the same nest serves the eagle during life; and indeed the pains bestowed in forming it seems to argue as much. It is asserted that as soon as the young ones are somewhat grown, the mother kills the most feeble or the most voracious. If this happens, it must proceed only from the necessities of the parent, who is incapable of providing for their support; and is content to sacrifice a part to the welfare of the majority.

The plumage of the eaglets is not so strongly marked as when they come to be adult. They are at first white; then inclined to yellow; and at last light brown. Age, hunger, long captivity, and diseases, make them whiter. It is said that they live above an hundred years: and that they at last die, not of old age, but from the beak turning inward upon the under mandible, and thus preventing their taking any food. They are indeed equally remarkable for their longevity, and for their power of sustaining a long absence from food. One of this species, which was lately nine years in the possession of Mr. Owen Holland, of Conway, lived thirty-two years with the gentleman who made him a present of it; but what its age was when the latter received it from Ireland, is unknown. The same bird also furnishes a proof of the truth of the other remark; having once, through the neglect of servants, endured hunger for twenty-one days, without any sustenance whatever. But this is still less extraordinary than an instance recorded by our author, M. de Buffon, whc was assured, by a person of veracity, that one of these birds being caught in a fox-trap, existed for five entire weeks without aliment. It shewed no appearance of languor till the last eight days, and it was killed at length in order to deliver it from its sufferings. The eagle seldom drinks, as its principal aliment is raw flesh, which contains in itself a sufficient quantity of moisture.

Such are the general characteristics and habitudes of the eagle: however, in some these habitudes differ, as the sea eagle and the osprey live chiefly upon fish, and consequently build their nests on the sea-shore, and by the sides of rivers, on the ground among reeds; and often lay three or four eggs, rather less than those of a hen, of a white elliptical form. They catch their prey, which is chiefly fish, by darting down upon them from above. The Italians compare the violent descent of these birds on their prey, to the fall of lead into water; and call them by the name of aquila piombina, or the leaden eagle.

Nor is the bald eagle, which is an inhabitant of North Carolina, less remarkable for habits peculiar to itself. These birds fly very heavily; so that they cannot overtake their prey, like others of the same denomination. To remedy this, they often attend the osprey, which they attack as soon as it has seized a fish: the osprey, therefore, being glad to escape by dropping the fish, with astonishing dexterity this bird seizes the unmerited prey, before it reaches the water.

These eagles also generally attend upon fowlers in the winter; and when any birds are wounded, they are sure to be seized by the eagle, though they may fly from the fowler. This bird will often steal young pigs, and carry them alive to the nest, which is composed of twigs, sticks, and rubbish: it is large enough to fill the body of a cart; and is commonly full of bones half eaten, and putrid flesh, the stench of which is intolerable.

The distinctive marks of each species are as follow.

The *golden eagle*: of a tawny, iron colour; the head and neck of a reddish iron; the tail feathers of a dirty white, marked with cross bands of tawny iron; the legs covered with tawny iron feathers.

The *common eagle*: of a brown colour; the head and upper part of the neck inclining to red; the tail feathers white, blackening at the ends; the outer ones, on each side, of an ash colour, the legs covered with feathers of a reddish brown. This eagle was called by the Greeks the *hare-killer*, as, though that animal is a common prey to all eagles, it is the usual and particular object of pursuit with this species.

The *bald eagle*: brown: the head, neck, and tail feathers white; the feathers of the upper part of the leg brown. Its length is three feet three inches. Inhabits both Europe and America

The *white eagle*: the whole white. But probably all white eagles are only varieties.

The *rough footed eagle*: of a dirty brown: spotted under the wings, and on the legs with white: the feathers of the tail white at the beginning and the point; the leg-feathers dirty brown, spotted with white. This eagle is very small, being not more than two feet and a half in length. It is remarkable for its plaintive cry.

The *white-tailed eagle*: dirty brown: head white: the stems of the feathers black; the rump inclining to black; the tail-feathers, the first half black, the end half white: legs naked.

The *erne*: a dirty iron colour above, an iron mixed with black below; the head and neck ash, mixed with chesnut;

the points of the wings blackish, the tail-feathers white; the legs naked.

The *black, or ring-tailed eagle*: blackish: the head and upper neck mixed with red; the tail-feathers, the first half white, speckled with black; the other half blackish; the leg-feathers dirty white. It inhabits Europe.

The *sea eagle:* inclining to white, mixed with iron brown; belly white, with iron coloured spots; the covert feathers* of the tail whitish; the tail-feathers black at the extremity; the upper part of the leg-feathers of an iron brown. It is somewhat smaller than the golden eagle, and is found in most parts of the world.

The *osprey:* brown above; white below; the back of the head white; the outward tail-feathers, on the inner side, streaked with white; legs naked. It is nearly as large as the golden eagle.

The *jean le blanc:* above, brownish grey; below, white, spotted with tawny brown; the tail-feathers on the outside, and at the extremity, brown; on the inside, white, streaked with brown; legs naked. Its length is about two feet, and it weighs from three pounds four ounces to three pounds seven ounces. It is common in France, but is rarely known elsewhere. It makes its nest on the ground among heath, &c.

The *eagle of Brazil:* blackish brown; ash colour mixed in the wings; tail-feathers white; legs naked.

The *Oroonoko eagle*: with a topping above, blackish brown; below, white spotted with black; upper neck yellow; tail-feathers brown, with white circles; leg-feathers white, spotted with black.

The *crowned African eagle*, with a topping: the tail of an ash-colour, streaked on the upper side with black.

The *eagle of Pondicherry:* chesnut colour, the six outward tail-feathers black one half.

Besides these, authors have enumerated the *Chinese eagle*, which is a most beautiful bird, of a reddish brown, with a bar of dark brown across the middle of the wing; the *white-bellied eagle;* the *Japanese eagle*, which is finely variegated; the *oriental eagle;* the *Javan eagle;* the *fierce eagle*, from Astracan; the *plaintive eagle*, from Terra del Fuego; the

* The coverts are the shorter featners which hide the base of the quill-feathers. On the wings there are the lesser, the greater, and the under-wing coverts. The *lesser coverts* are small feathers which lie in several rows on the bones of the wings; the *greater coverts* are those which lie immediately over the quills, as well as over the *secondaries*, or quills of the second joint; the *under coverts* line the inside of the wings. One term more it may be proper to explain, that is, the *scapulars*, which are the feathers that rise from the shoulders and cover the back. Editor.

black-cheeked eagle; the *spotted eagle;* the *statenland eagle;* the *Russian and equinoctial eagles*, and the *Mansfeury*. Most of these take their names from their characteristic quality; and, indeed, minutely to describe them would greatly extend the volume, without adding much to the entertainment of the reader.

THE CONDOR. Of all the birds which are endowed with the power of flight, the condor must be allowed universally to be the largest. It also possesses, in a higher degree than any of the feathered tribe, all the qualities that render it formidable, not only to animals of its own kind, but to beasts, and even to man himself. It is eighteen feet across the wings when extended. The beak is so strong as to pierce the body of a cow: and two of them are able to devour it. They do not even abstain from man himself; but fortunately there are but few of the species. The Indians assert, that they will carry off a deer, or a young calf, in their talons, as eagles an hare or a rabbit. They seldom frequent the forests, as they require a large space for the display of their wings; but are found on the sea-shore, and the banks of rivers, whither they descend, at certain seasons, from the heights of the mountains. Condamine has frequently seen them in several parts of the mountains of Quito, and observed them hovering over flocks of sheep; and he thinks they would, at a certain time, have attempted to carry one off had they not been scared away by the shepherds. The condor is of a brown colour; round the neck they have often a white ruff; and on their head a brown comb, which however is not indented like the cock. It has by most naturalists been classed among the vultures, on account of its neck and head, which are bare of feathers; but if we judge by its natural habits, and internal qualities, we should rather place it among the eagles, whom it rivals in fierceness as well as in courage.

It is doubted whether this animal be proper to America only, or whether it may not have been described by the naturalists of other countries. It is supposed, that the great bird, called the rock, described by Arabian writers, and so much exaggerated by fable, is but a species of the condor. The great bird of Tarnassar, in the East Indies, which is larger than the eagle, as well as the vulture of Senegal, which carries off children, are probably no other than the bird we have been describing. Russia, Lapland, and even Switzerland and Germany, are said to have known this animal. In the deserts of Pachomac, where it is chiefly seen, men seldom venture to travel. Those wild regions are very sufficient of

themselves to inspire a secret horror: broken precipice prowling panthers—forests only vocal with the hissing of serpents—and mountains rendered still more terrible by the condor, the only bird that ventures to make its residence in those deserted situations.

THE VULTURE. The first rank among birds of prey has been assigned to the eagle, not because it is larger than the vulture, but because it is more noble and courageous; and possesses, at least, as much an inclination for war as an appetite for prey; the vulture is deficient in all the more respectable qualities of the eagle, and only rivals it in size, in strength, and rapacity.

Vultures may be easily distinguished from all those of the eagle kind, by the nakedness of their heads and necks, which are without feathers, and only covered with a very slight down, or a few scattered hairs. Their eyes are more prominent; those of the eagle being buried more in the socket. The claws are shorter, and less hooked. The inside of the wing is covered with a thick down, which is different in them from all other birds of prey. Their attitude is not so upright as that of the eagle; and their flight more difficult and heavy.

They are still more strongly marked by their nature, which in all vultures is cruel, unclean, and indolent. Their sense of smelling, however, is amazingly great; and Nature, for this purpose, has given them two large apertures or nostrils without, and an extensive olfactory membrane within. They seem adapted inwardly, not only for being carnivorous, but to eat corn, or whatever of that kind comes in their way.

This bird, which is common in many parts of Europe, and but too well known on the western continent, is totally unknown in England. In Egypt, Arabia, and many other kingdoms of Africa and Asia, vultures are found in great abundance. The inside down of their wing is converted into a warm and comfortable kind of fur, and is commonly sold in the Asiatic markets.

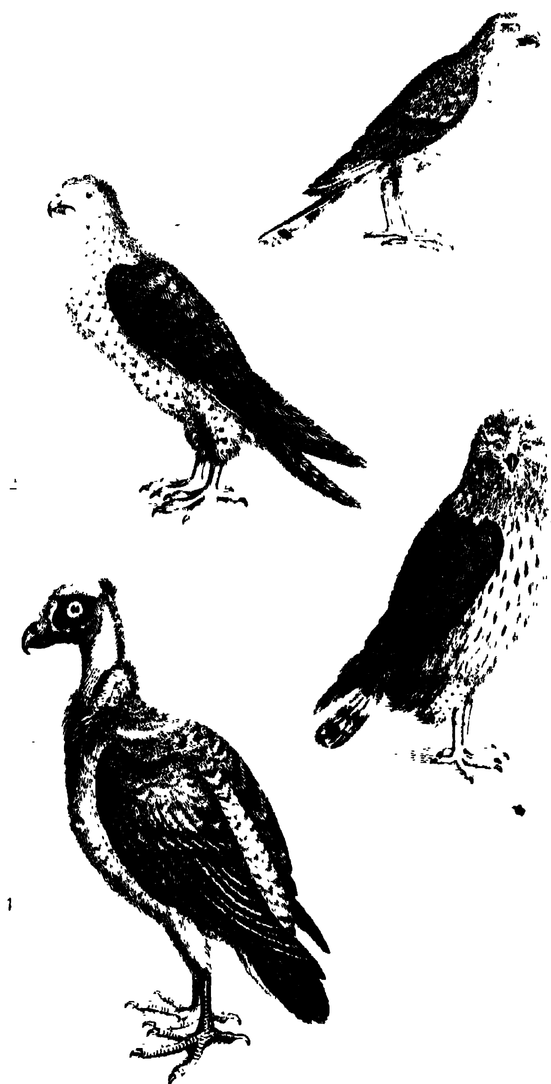
In Egypt, indeed, this bird seems to be of singular service. There are great flocks of them in the neighbourhood of Grand Cairo, which no person is permitted to destroy. The service they render the inhabitants, is devouring all the carrion and filth of that great city; which might otherwise tend to corrupt and putrefy the air. They are commonly seen in company with the wild dogs of the country, tearing a carcass very deliberately together. This odd association produces no quarrels; the birds and quadrupeds seem to live

amicably, and nothing but harmony subsists between them. The wonder is still the greater, as both are extremely rapacious, and both lean and bony to a very great degree: probably having no great plenty even of the wretched food on which they subsist.

In America, they lead a life somewhat similar. Wherever the hunters, who there only pursue beasts for the skins, are found to go, these birds are seen to pursue them. They still keep hovering at a little distance; and when they see the beasts flayed and abandoned, they call out to each other, pour down upon the carcass, and in an instant, pick its bones as bare and clean as if they had been scraped by a knife.

The sloth, the filth, and wretchedness of these birds, almost exceed credibility. In the Brazils, where they are found in great abundance, when they light upon a carcass, which they have liberty to tear at their ease, they so gorge themselves that they are unable to fly; but keep hopping along when they are pursued. At all times, they are a bird of slow flight, and unable readily to raise themselves from the ground; but when they have overfed, they are then utterly helpless; but they soon get rid of their burthen; for they have a method of vomiting up what they have eaten, and then they fly off with greater facility.

It is pleasant to be a spectator of the hostilities between animals that are thus hateful or noxious. Of all creatures, the two most at enmity is the vulture of Brazil, and the crocodile. The female of this terrible amphibious creature, which in the rivers of that part of the world grows to the size of twenty-seven feet, lays its eggs, to the number of one to two hundred, in the sands, on the side of the river, where they are hatched by the heat of the climate. For this purpose, she takes every precaution to hide from all other animals the place where she deposits her burthen: in the mean time, a number of vultures sit, silent and unseen, in the branches of some neighbouring forest, and view the crocodile's operations, with the pleasing expectation of succeeding plunder. They patiently wait till the crocodile has laid the whole number of her eggs, till she has covered them carefully with the sand, and until she is retired from them to a convenient distance. Then, altogether, encouraging each other with cries, they pour down upon the nest, hook up the sand in a moment, lay the eggs bare, and devour the whole brood without remorse. Wretched as is the flesh of these animals, yet men, perhaps, when pressed by hunger, have been tempted to taste it. Nothing can be more lean, stringy, nauseous, and unsavory. Every attempt has been made to render it palatable, but in vain. These



1. Sparrow Hawk 2. Falcon. 3. Buzzard 4. King Vulture

birds, at least those of Europe, usually lay two eggs at a time, and produce but once a year. They make their nests in inaccessible cliffs, and in places so remote that it is rare to find them.

The most remarkable species of the vulture are as follow:

The *Alpine Vulture*, or percnopter. The male of which Linnæus says is wholly white; the quills black with hoary edges, except the two outer ones, which are entirely black. The female is quite brown, except the four outer quills, which are black. In size it exceeds the common eagle. They fly in troops, and are very useful in destroying mice.

The *Fulvous Vulture*, or *Griffon*. It is about three feet six inches in length, and eight feet in the wings. The head, neck, and ruff, are white; the back reddish grey; the quills and tail black; the breast bare of feathers, and covered with downy hair. This is probably a variety of the golden vulture

The *Golden Vulture* is larger than the golden eagle, being four feet eight inches long. The body is black above, and reddish beneath; the quills and tail brown.

The *cinereous*, or *great vulture*, is rather less than the last species, but larger than the common eagle. The head and neck are covered with brown down, and beneath the throat there is a kind of beard. The body is brown, and the legs are feathered down to the toes. It inhabits Europe.

The *hare vulture* is smaller than all the preceding. It is of a shining reddish black; the breast inclining to yellow. It is found in many parts of Europe and Asia. When it is sitting or standing, it erects a crest on its head, which does not appear when it flies.

The *ash-coloured*, or *small vulture*, is the size of a large cock. It is generally of a sooty grey, spotted with chesnut, and the head and neck white. One which was received from Norway had the head and neck bare, and of a reddish colour, and the body almost entirely white, except the quills, which were black.

Of those birds which may be accounted foreign, that which is called the *king vulture* greatly demands pre-eminence. It is the size of a hen turkey. The head and neck are entirely bare of feathers, but a fillet of blackish down encompasses the head. At the bottom of the neck, just above the shoulders, there is a ruff of ash-coloured feathers. The body is a reddish brown, the belly white, with a tinge of yellow, and the quills are black. It is a native of South America and the West Indies.

The *carrion vulture*, or *turkey buzzard*, is the next in order and consequence. They are found in vast flocks in all parts of America, where they are of great utility in destroying snakes and vermin, and in devouring the dead and putrid carcases. This bird is about the size of a turkey. The head and neck are bare of feathers, and of a reddish colour, and the sides of the head warted like those of the turkey. The whole plumage is a brownish black, with a purple and greenish gloss in different directions.

The *Egyptian vulture* is much of the same nature, but is not above the size of a kite.

But of all the birds of this genus, the *Secretary* is the most elegant. It is full three feet in height; the bill black, and like that of an eagle. On the upper eye-lid there are large bristles, like eye-lashes, and from the back of the head springs a beautiful pendant crest. The body in general is ash-coloured, and the tips of the wings are black. It inhabits all the southern parts of Africa.

Besides these, naturalists have mentioned the *crested vulture*, the *Arabian vulture*, the *bearded vulture*, the *black vulture*, the *Angola*, and the *Bengal vultures*, the *tawny vulture*, &c.

THE FALCON. Falconry, which is now so much disused among us, was the principal amusement of our ancestors. A person of rank scarcely stirred out without his hawk on his hand, which in old paintings is the criterion of nobility. The expense which attended this sport was very great: among the old Welch princes, the king's falconer was the fourth officer in the state; but, notwithstanding all his honours, he was forbidden to take more than three draughts of beer from his horn, lest he should get drunk and neglect his duty. In the reign of James the First, Sir Thomas Monson is said to have given a thousand pounds for a cast of hawks; and such was their value in general, that it was made felony in the reign of Edward the Third to steal a hawk. To take its eggs, even in a person's own ground, was punishable with imprisonment for a year and a day, together with a fine at the king's pleasure.

Of many of the ancient falcons used for this purpose, we at this time know only the names. Of those in use at present, both here and in other countries, are the gyr-falcon, the falcon, the lanner, the sacre, the hobby, the kestril, and the merlin. These are called the long-winged hawks, to distinguish them from the goss-hawk, the sparrow-hawk, the kite, and the buzzard, that are of shorter wing, and either

too slow, too cowardly, too indolent, or too obstinate, to be serviceable in contributing to the pleasure of the field.

The *gyr-falcon* leads in this bold train. In size he exceeds all other falcons, for he approaches nearly to the magnitude of the eagle. The top of the head is flat, and of an ash colour, with a strong, thick, short, and blue beak. The feathers of the beak and wings are marked with black spots, in the shape of an heart; he is a courageous and fierce bird, nor fears even the eagle himself; but he chiefly flies at the stork, the heron, and the crane. He is most found in the colder regions of the north, but loses neither his strength nor his courage when brought into the milder climates.

The *falcon*, properly so called, is the second in magnitude and fame. There are some varieties in this bird; but there seem to be only two that claim distinction; the *falcon-gentil*, and the *peregrine-falcon;* both are much less than the gyr, and somewhat about the size of a raven. Next in size to these is the *lanner*, a bird now very little known to Europe; then follows the *sacre*, the legs of which are of a bluish colour, and serve to distinguish that bird; to them succeeds the *hobby*, used for smaller game, for daring larks, and stooping at quails. The *kestril* was trained for the same purpose; and last the *merlin*; which, though the smallest of all the hawk or falcon kind, and not much larger than a thrush, yet displays a degree of courage that renders him formidable even to birds ten times his size. He has often been known to kill a partridge or a quail at a single pounce from above.

The courage of these creatures in general was such, that no bird, not very much above their own size, could terrify them; their swiftness so great, that scarce any bird could escape them; and their docility so remarkable, that they obeyed not only the commands, but the signs of their master. They remained quietly perched upon his hand till their game was flushed, or else kept hovering round his head without ever leaving him but when he gave permission. The common falcon is a bird of such spirit, that, like a conqueror in a country, he keeps all birds in awe and in subjection to his prowess. Where he is seen flying wild, the birds of every kind, that seemed entirely to disregard the kite or the sparrow-hawk, fly with screams at his most distant appearance.

In order to train up a falcon, the master begins by clapping straps upon his legs, which are called jesses, to which are fastened a ring with the owner's name, by which, in case he should be lost, the finder may know where to bring him back. To these also are added little bells, which serve to mark the place where he is seen, if lost in the chace. He is

always carried on the hand, and is obliged to be kept without sleeping. If he be stubborn, and attempts to bite, his head is plunged into water. Thus, by hunger, watching, and fatigue, he is constrained to submit to having his head covered by a hood or cowl, which covers his eyes. This troublesome employment continues often for three days and nights without ceasing. It rarely happens but at the end of this his necessities, and the privation of light make him lose all idea of liberty, and bring down his natural wildness. His master judges of his being tamed when he permits his head to be covered without resistance, and when uncovered he seizes the meat before him contentedly. The repetition of these lessons by degrees ensures success. His wants being the chief principle of his dependance, it is endeavoured to increase his appetite by giving him little balls of flannel, which he greedily swallows. Having thus excited the appetite, care is taken to satisfy it; and thus gratitude attaches the bird to the man who but just before had been his tormentor.

When the first lessons have succeeded, and the bird shews signs of docility, he is carried out upon some green, he head is uncovered, and, by flattering him with food at different times, he is taught to jump on the hand, and to continue there. When confirmed in this habit, it is then thought time to make him acquainted with the lure. This lure is only a thing stuffed like the bird the falcon is designed to pursue, such as an heron, a pigeon, or a quail, and on this lure they always take care to give him his food. It is quite necessary that the bird should not only be acquainted with this, but fond of it, and delicate in his food when shewn it. The use of this lure is to flatter him back when he has flown in the air, which he sometimes fails to do; and it is always requisite to assist it by the voice and the signs of the master. When the familiarity and the docility of the bird are sufficiently confirmed on the green, he is then carried into the open fields, but still kept fast by a string which is about twenty yards long. He is then uncovered as before; and the falconer, calling him at some paces distance, till he comes at last to fly to it. The next day the lure is shewn him at a greater distance, till he comes at last to fly to it at the utmost length of his string. He is then to be shewn the game itself alive, but disabled or tame, which he is designed to pursue. After having seized this several times with his string, he is then left entirely at liberty, and carried into the field for the purposes of pursuing that which is wild. At that he flies with avidity; and when he has seized it, or killed it, he is brought back by the voice and the lure.

By this method of instruction, an hawk may be taught to fly at any game whatsoever; but falconers have chiefly confined their pursuit only to such animals as yield them profit by the capture, or pleasure in the pursuit The hare, the partridge, and the quail, repay the trouble of taking them; but the most delightful sport is the falcon's pursuit of the heron, the kite, or the wood-lark. Instead of flying directly forward, as some other birds do, these, when they see themselves threatened by the approach of the hawk, immediately take to the skies. They fly almost perpendicularly upward, while their ardent pursuer keeps pace with their flight, and tries to rise above them. Thus both diminish by degrees from the gazing spectator below, till they are quite lost in the clouds; but they are soon seen descending, struggling together, and using every effort on both sides; the one of rapacious insult, the other of desperate defence. The unequal combat is soon at an end: the falcon comes off victorious, and the other, killed or disabled, is made a prey either to the bird or the sportsman.

As for other birds, they are not so much pursued, as they generally fly straight forward, by which the sportsman loses sight of the chace, and what is still worse, runs a chance of losing his falcon also. The pursuit of a lark by a couple of merlins is considered, by him only who regards the sagacity of the chace, as one of the most delightful spectacles this exercise can afford. The amusement is, to see one of the merlins climbing to get the ascendant of the lark, while the other, lying low for the best advantage, waits the success of its companion's efforts; thus, while one stoops to strike its prey, the other seizes it at its coming down.

The more ignoble race of birds make up by cunning and assiduity what these claim by force and celerity. The kite, which may be distinguished from all the rest of this tribe by his forky tail, and his slow floating motion, seems almost for ever upon the wing. He lives only upon accidental carnage, as almost every bird in the air is able to make good his retreat against him. He may be therefore considered as an insidious thief, who only prowls about, and when he finds a small bird wounded, or a young chicken strayed too far from the mother, instantly seizes the hour of calamity, and, like a famished glutton, is sure to shew no mercy. His hunger, indeed, often urges him to acts of seeming desperation. We have seen one of them fly round and round for a while to mark a clutch of chickens, and then on a sudden dart like lightning upon the unresisting little animal, and carry it off, the hen in vain crying out, and the boys hooting and casting stones to scare it

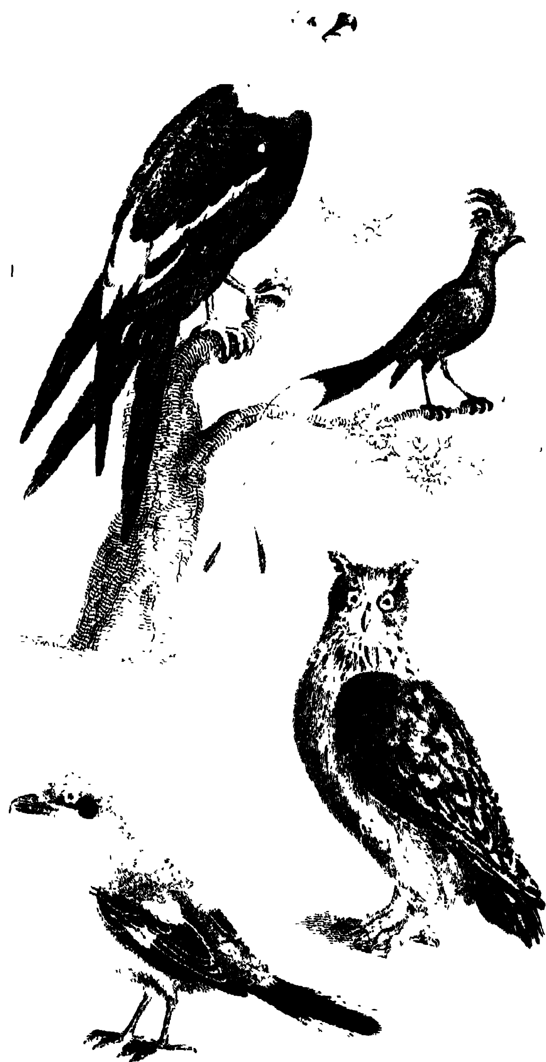
from its plunder. For this reason, of all birds, the kite is the good housewife's greatest tormenter and aversion.

Of all obscene birds, the kite is the best known; but the buzzard among us is the most common. This bird is in length one foot eight inches. The back and wings are brown; the belly is yellowish, spotted with brown, and the tail is a light brown tanned with black. The buzzard is a sluggish, inactive bird, and often remains perched whole days together upon the same bough. He is rather an assassin than a pursuer; and lives more upon frogs, mice, and insects, which he can easily seize, than upon birds which he is obliged to follow. He lives in summer by robbing the nests of other birds, and sucking their eggs, and more resembles the owl kind in his countenance than any other rapacious bird of day. The *goss-hawk* and *sparrow-kawk* are what Mr. Willoughby calls short-winged birds, and are consequently unfit for training, however injurious they may be to the pigeon-house or the sportsman. They have been indeed taught to fly at game; but little is to be obtained from their efforts, being difficult of instruction, and capricious in their obedience.

. Of the buzzard, kite, and falcon kind, above seventy different species, foreign and domestic, have been enumerated. Of all these the nature and properties are nearly the same, and the description we have given of the gyr-falcon will apply to most of the hawk species, only differing in size and other minuter particulars; and that of the buzzard to the kites in general, with the same allowance. Of the foreign birds of these species, some are crested, and others have plumage differing from ours. Of the *swallow-tailed falcon* of America, the head, neck, and breast are white, the back and wings are black, glossed with purple and green. The tail is forked like that of a swallow, and like that bird it subsists almost entirely on the wing. It is rather smaller than the common kite.

THE SHRIKE, or BUTCHER BIRD. Before we conclude this short history of rapacious birds that prey by day, it may not be improper to describe a tribe of smaller birds, that seem from their size rather to be classed with the harmless order of the sparrow kind; but which from their crooked beak, courage, and appetite for slaughter, certainly deserve a place here. The lesser butcher bird is not much above the size of a lark; that of the smallest species is not so big as a sparrow; yet, diminutive as these little animals are, they make themselves formidable to birds of four times their dimensions.

The *great cinerous shrike*, or *butcher bird*, is sometimes



1. Swallow tailed Falcon 2. Malabar Shrike
3. Horned Owl 4. [illegible] Bird

nearly a foot in length; its bill is black, an inch long, and hooked at the end; at the same time its legs and feet are slender, and its toes are formed rather like those of such as live chiefly upon insects and grain. Its plumage on the back is pale ash-colour, the belly is white, and a black stripe runs from the beak parallel with its eyes. Its habits seem to correspond with its conformation, and it lives as well upon flesh as upon insects, and thus partakes in some measure of a double nature. Its appetite for flesh, however, is the most prevalent; and it never takes up with the former when it can obtain the latter. This bird, therefore, leads a life of continual combat and opposition. As from its size it does not much terrify the smaller birds of the forest, so it very frequently meets birds willing to try its strength, and it never declines the engagement. In Russia it is trained for catching small birds like a falcon.

It is wonderful to see with what intrepidity this little creature goes to war with the pie, the crow, and the kestril, all above four times larger than itself. It not only fights upon the defensive, but often comes to the attack, and always with advantage, particularly when the male and female unite to protect their young, and to drive away the more powerful birds of rapine. At that season, they do not wait the approach of their invader; it is sufficient that they see him preparing for the assault at a distance. It is then that they sally forth with loud cries, wound him on every side, and drive him off with such fury, that he seldom ventures to return to the charge. In these disputes, they generally come off with the victory, though it sometimes happens that they fall to the ground with the bird they have so fiercely fixed upon, and the combat ends with the destruction of the assailant as well as of the defender.

For this reason, the most redoubtable birds of prey respect them; while the kite, the buzzard, and the crow, seem rather to fear than seek the engagement. Nothing in nature better displays the respect paid to the claims of courage, than to see this little bird, apparently so contemptible, fly in company with the lanner, the falcon, and all the tyrants of the air without fearing their power, or avoiding their resentment.

As for small birds, they are its usual food. It seizes them by the throat, and strangles them in an instant. When it has thus killed the bird or insect, it is asserted that it fixes them upon some neighbouring thorn, and, when thus spitted, pulls them to pieces with its bill. It is supposed that as nature has not given this bird strength sufficient to tear its prey to pieces with its feet, as the hawks do, it is obliged to have recourse to this extraordinary expedient.

During summer, such of them as constantly reside here, for the smaller red butcher-bird migrates, remain among the mountainous parts of the country; but in winter they descend into the plains and nearer human habitations. The larger kind make their nests on the highest trees, while the lesser build in bushes in the fields and hedge-rows. They both lay about six eggs, of a white colour, but encircled at the larger end with a ring of a brownish red. The nest on the outside is composed of white moss, interwoven with long grass; within, it is well lined with wool, and it is usually fixed among the forking branches of a tree. The female feeds her young with caterpillars and other insects while very young; but soon after accustoms them to flesh, which the male procures with surprising industry. Their nature also is very different from other birds of prey in their parental care: for, so far from driving out their young from the nest to shift for themselves, they keep them with care; and even when adult they do not forsake them, but the whole brood live in one family together. Each family lives apart, and is generally composed of the male, female, and five or six young ones: these all maintain peace and subordination among each other, and hunt in concert. It is easy to distinguish these birds at a distance, not only from their going in companies, but also from their manner of flying, which is always up and down, seldom direct or side-ways.

Of these birds there are above forty different kinds, foreign and domestic; but the great *cinereous butcher-bird* is the least known among us. The *red-backed*, which is in length seven inches and a half, and which is of a reddish brown, with a black tail, migrates in autumn, and does not return till spring. The *woodchat* resembles the former, except in the colour of the back, which is brown, and not red, as in the other.

The foreign birds of the shrike genus are infinitely varied in plumage. The *Malabar shrike* is conspicuous for the singularity and beauty of its form. It is the size of the missel thrush. The general colour of its plumage is black, though on the back it is glossed with a fine shade of blue. Its head is crested, and the two outer feathers of the tail are three times the length of the others, and have for about six inches the shaft quite naked.

THE OWL. All birds of the owl kind have one common mark, by which they are distinguished from others; their eyes, like those of tigers and cats, are formed for seeing better in the dusk, than in the broad glare of sun-shine.

The pupil, in fact, is capable of opening very wide, or shutting very close; and, by contracting it, the brighter light of the day, which would act too powerfully upon the sensibility of the eye, is excluded; while, by dilating the pupil, the animal takes in the more feint rays of the night, and thereby is enabled to spy its prey, and catch it with greater facility in the dark.

But though owls are dazzled by too bright a day-light, yet they do not see best in the darkest nights, as some have been apt to imagine.

The nights when the moon shines are the times of their most successful plunder; for when it is wholly dark, they are less qualified for seeing and pursuing their prey: except therefore, by moonlight, they contract the hours of their chase; and if they come out at the approach of dusk in the evening, they return before it is totally dark, and then rise by twilight the next morning, to pursue their game, and to return, in like manner, before the broad day-light begins to dazzle them with its splendour.

Yet the faculty of seeing in the night, or of being entirely dazzled by day, is not alike in every species of these nocturnal birds. The common white or barn owl, for instance, sees with such exquisite acuteness in the dark, and though the barn has been shut at night, and the light thus totally excluded, yet it perceives the smallest mouse that peeps from its hole: on the contrary, the brown horned owl is often seen to prowl along the hedges by day, like the sparrow-hawk; and sometimes with good success.

The birds of the owl kind may be divided into two sorts; those that have horns, and those without. These horns are nothing more than two or three feathers that stand up on each side of the head over the ear, and give this animal a kind of horned appearance. Of the horned kind, is the *great eared* or *horned owl*, which at first view appears as large as an eagle, though, when he comes to be observed more closely, he will be found much less. His eyes are large and transparent, encircled with an orange coloured iris: his ears are large and deep: his plumage is of reddish brown, marked on the back with black and yellow spots, and yellow only upon the belly. This bird has been seen in Scotland, and in Yorkshire, but is not common in England.

Next to this we may class that which is called the *long-eared owl*. It is in length fourteen inches and a half. The eared tufts consist of six feathers. It is a reddish brown. The legs are feathered down to the toes. These birds are seldom at the trouble of making a nest for themselves, but

generally take possession of an old magpie's or buzzard's nest. They lay four or five eggs. The young are white at first, but come to their colour in fifteen days. They are common in France and England.

The *short-eared owl* is only fourteen inches long. It has one feather half an inch longer than the rest on each side of the head, which it can erect at pleasure. Its back is brown, and the belly a pale yellow, streaked with brown. The legs are feathered to the toes. It may be accounted a bird of passage, visiting us in October, and retiring in spring.

The *scops* is still smaller than the last mentioned bird, which it resembles in most respects. It is, however, only seven or eight inches long, that is, not so large as a thrush; its ears consist of two feathers, which are just elevated above the others. In France it appears as a bird of passage; but it is dubious whether it ever visits England.

To these succeeds the tribe without horns. The *howlet*, or *aluco*, which is the largest of this kind, with dusky plumes, and black eyes; the *screech*, or *tawny owl*, of a smaller size, that is, about fourteen inches, with blue eyes, and plumage of an iron-grey; the *white owl*, about as large as the former, with yellow eyes, and whitish plumage; the *brown owl*, less than the former, with brown plumage, and a brown beak; and, lastly, the *little brown owl*, with yellowish-coloured eyes, and an orange-coloured bill.

Of those owls which may in France and England be termed foreign, nearly thirty different species have been enumerated. The *Siberian eared owl* is a most beautiful little bird, about the size of a house-sparrow, that is, scarcely six inches in length. The bill is brown, the eared feathers one inch in height. The whole body is ash-coloured, and delicately powdered, and variegated with brown and white spots.

The *spectacled owl*, is about three times as large as the preceding. The feathers on the head and neck are white and woolly; but on each side of the head there is a large patch of blackish brown, which surrounds the eyes The upper parts of the body are reddish brown, with a bar of the same kind crossing the breast; the under parts of the body are white.

All this tribe of animals, however they may differ in their size and plumage, agree in their general characteristics of preying by night; their bodies are strong and muscular; their feet and claws made for tearing their prey; and their stomachs for digesting it. It must be remarked, however, that the digestion of all birds that live upon mice, lizards, or such like food, is not very perfect; for though they swallow them whole yet they are always seen some time

after to disgorge the skin, and bones, rolled up in a pellet, as being indigestible

As they are incapable of supporting the light of the day, or at least of then seeing and readily avoiding their danger, they keep all this time concealed in some obscure retreat, suited to their gloomy appetites, and there continue in solitude and silence. The cavern of a rock, the darkest part of an hollow tree, the battlements of a ruined unfrequented castle, some obscure hole in a farmer's out-house, are the places where they are usually found: if they be seen out of these retreats in the day-time, they may be considered as having lost their way; as having by some accident been thrown into the midst of their enemies, and surrounded with danger.

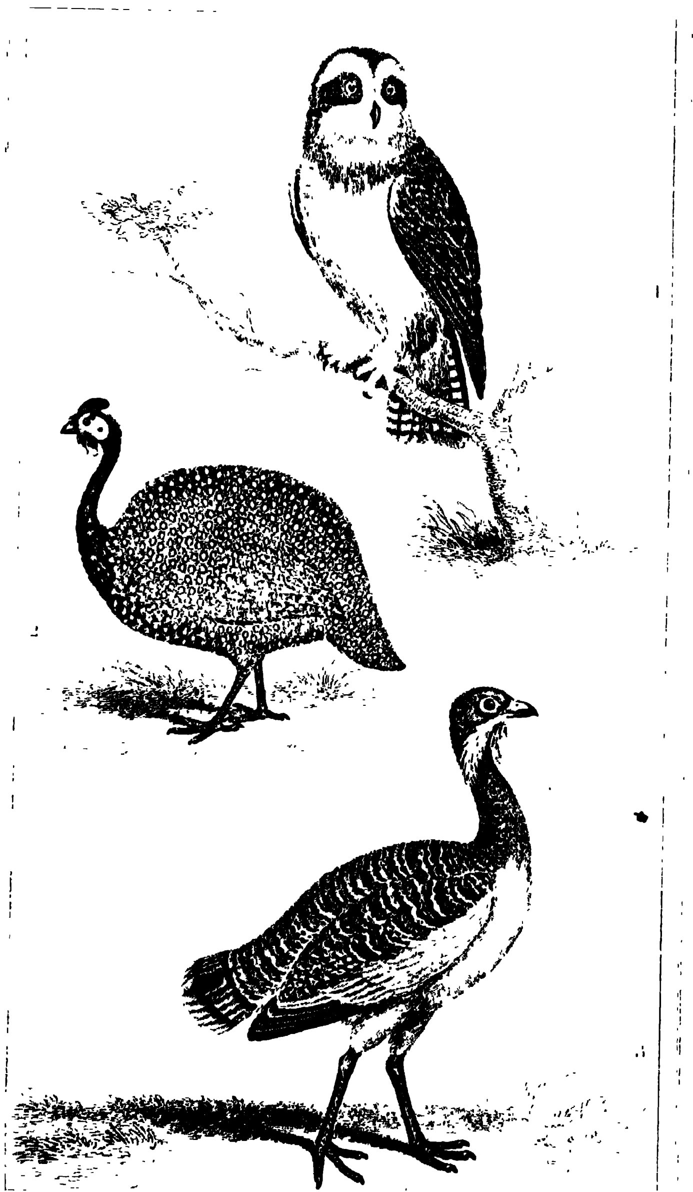
In this distress they are obliged to take shelter in the first tree or hedge that offers, there to continue concealed all day, till the returning darkness once more supplies them with a better plan of the country. But it too often happens, that, with all their precaution to conceal themselves, they are spied out by the other birds of the place, and are sure to receive no mercy. The blackbird, the thrush, the jay, the bunting, and the reb-breast, all come in file, and employ their little arts of insult and abuse. The smallest, the feeblest, and the most contemptible of this unfortunate bird's enemies are then the foremost to injure and torment him. They increase their cries and turbulence round him, flap him with their wings, and are ready to shew their courage to be great, as they are sensible that their danger is but small. The unfortunate owl, not knowing where to attack, or whether to fly, patiently sits and suffers all their insults. Astonished and dizzy, he only replies to their mockeries by awkward and ridiculous gestures, by turning his head, and rolling his eyes with an air of stupidity. It is enough that an owl appears by day to set the whole grove into a kind of uproar. Either the aversion all the small birds have to this animal, or the consciousness of their own security, makes them pursue him without ceasing, while they encourage each other by their mutual cries to lend assistance in their laudable undertaking.

It sometimes happens, however, that the little birds pursue their insults with the same imprudent zeal with which the owl himself had pursued his depredations. They hunt him the whole day until evening returns; which restoring him his faculties of sight once more, he makes the foremost of his pursuers pay dear for their former sport; nor is man always an unconcerned spectator here. The bird-catchers have got an art of counterfeiting the cry of an owl exactly; and, having before lined the branches of an hedge, they sit un-

seen and give the call. At this, all the little birds flock to the place where they expect to find their well-known enemy; but, instead of finding their stupid antagonist, they are stuck fast to the hedge themselves. This sport must be put in practice an hour before night-fall, in order to be successful; for if it is put off till later, those birds which but a few minutes sooner came to provoke their enemy, will then fly from him with as much terror as they just before shewed insolence.

It is not unpleasant to see one stupid bird made in some sort a decoy to deceive another. The great horned owl is sometimes made use of for this purpose to lure the kite, when the falconer desires to catch him for the purposes of training the falcon. Upon this occasion, they clap the tail of a fox to the great owl, to render his figure extraordinary; in which trim he sails slowly along, flying low, which is his usual manner. The kite, either curious to observe this odd kind of animal, or perhaps inquisitive to see whether it may not be proper for food, flies after, and comes nearer and nearer. In this manner he continues to hover, and sometimes to descend, till the falconer, setting a strong winged hawk against him, seizes him for the purpose of training his young ones at home.

The usual place where the great horned owl breeds is in the cavern of a rock, the hollow of a tree, or the turret of some ruined castle. Its nest is near three feet in diameter, and composed of sticks, bound together by the fibrous roots of trees, and lined with leaves on the inside. It lays about three eggs, which are larger than those of a hen, and of a colour somewhat resembling the bird itself. The lesser owl of this kind never makes a nest for itself, but always takes up with the old nest of some other bird, which it has often been forced to abandon. It lays four or five eggs; and the young are all white at first, but change colour in about a fortnight. The other owls in general build near the place where they chiefly prey; that which feeds upon birds in some neighbouring grove, that which preys chiefly upon mice near some farmer's yard, where the proprietor of the place takes care to give it perfect security. In fact, whatever mischief one species of owl may do in the woods, the barn-owl makes a sufficient recompense for, by being equally active in destroying mice nearer home; so that a single owl is said to be more serviceable than half a dozen cats in ridding the barn of its domestic vermin. "In the year 1580," says an old writer, "at Hallontide, an army of mice so over-run the marshes near Southminster, that they eat up the grass to the very roots. But at length a great number of strange painted owls came and devoured all the mice. The like happened again in Essex about sixty years after."



1. Spectacled Owl _ 2. Guinea Hen 3. Bustard

CHAP. II.

Of Birds of the Gallinaceous, or Poultry Order—The BUSTARD *—The little Bustard—Foreign Birds—The Hoobara, and the Rhaad—The* COCK*—The* TURKEY*—The horned Turkey—The Guan, Yacou, and Marail Turkies—The* PINTADO*—The* GROUS*—The Cock of the Wood—The Black and Red Grous—The Hazel Grous—The Pintailed Grous—The Ptarmigan—The Ruffed Grous—The* PEACOCK*—The* PHEASANT*—The Golden, Argus, Superb, and Impeygan Pheasant—The* CURASSOW*—Cushewbird—The* PARTRIDGE*—The Francolin—The Quail—Crested Quail, &c.—The Columbine Order—The Tame* PIGEON*—The Ring Dove—The Crown Pigeon—The Turtle Dove.*

The Gallinaceous (or Poultry) Order.

IT is obvious that this order of birds is the very opposite of that which we have so lately been describing. They are without talons, the hooked bills of the rapacious kind; but there is another particular of still more importance in which they materially differ. In the rapacious order, which feed upon flesh, the digestion is carried on by means of a liquid in the stomach, which dissolves the food. In this, which feeds chiefly upon grain, the gizzard is the principal instrument which grinds and reduces the grain to a pulp. This fact is decisively proved by an easy experiment. If a grain of corn be inclosed in a tube or a globe of metal which is strong enough to resist the action of the gizzard, it will pass through the body of the fowl, the grain a little swelled, but completely unaltered for any of the purposes of digestion or nourishment.

THE BUSTARD is the largest land-bird that is a native of Europe. It was once much more numerous than it is at present; but the encreased cultivation of the country, and the extreme delicacy of its flesh, has greatly thinned the species; so that a time may come when it may be doubted whether ever so large a bird was bred among us. It is probable that long before this the bustard would have been extirpated, but for its peculiar manner of feeding. It inhabits only the open and extensive plain, where its food lies in abundance, and where every invader may be seen at a distance.

The weight of this bird varies considerably, some have been found of not more than ten pounds, others have been found of twen[illegible] seven, and even thirty. The bustard is distinguished from the ostrich, the touyou, the cassowary and the dodo, by its wings, which, although disproportioned to the size of its body, yet serve to elevate it in the air, and enable it to fly, though with some difficulty; they are generally about four feet from the tip of one to the other. The neck is a foot long, and the legs a foot and a half. The head and [illegible]eck of the male are ash-coloured; the back is barred transversely with black, bright, and rust-colour. The greater quill feathers are black; the belly white; and the tail, which consists of twenty feathers, is marked with broad black bars.

The bustard (according to Plutarch) is found in Lybia, in the environs of Alexandria, in Syria, in Greece, in Spain, in France, in the plains of Poitou and Champagne; they are frequently seen in flocks of fifty or more, in the extensive downs of Salisbury Plain, in the heaths of Sussex and Cambridgeshire, the Dorsetshire uplands, and as far as East Lothian, in Scotland. In those extensive plains, where there are no woods to screen the sportsman, nor hedges to creep along, the bustards enjoy an indolent security. Their food is composed of the berries that grow among the heath, and the large earthworms that appear in great quantities on the downs before sun-rising in summer. It is in vain that the fowler creeps forward to approach them, they have always centinels placed at proper eminences, which are ever on the watch, and warn the flock of the smallest appearance of danger. All therefore that is left the sportsman, is the comfortless view of their dis[illegible]t security. He may wish, but they are in safety.

It sometimes happens that these birds, though they are seldom shot by the gun, are run down by grey-hounds. As they are voracious and greedy, they often sacrifice their safety to their appetite, and feed themselves so very fat, that they are unable to fly without great preparation. When the grey-hound, therefore, comes within a certain distance, the bustard runs off flapping its wings, and endeavouring to gather air enough under them to rise; in the mean time, the enemy approaches nearer, till it is too late for the bird even to think of obtaining safety by flight; for just at the rise there is always time lost, and of this the bird is sensible; it continues, therefore, on the foot until it is taken.

If we may credit Ælian, there is no contrivance so simple as not to be fit for the capture of this bird, since that author relates, that, in the kingdom of Pontus, the foxes make use of a curious stratagem in order to take them. The fox ele-

vates his bushy tail, which he causes to imitate as much as possible the motion of the bird's neck; the bustards, he adds, which mistake it for a bird of their species, approach it without apprehension, and become the prey of that crafty [illegible]! All this, however, supposes infinite cunning in the fox, infinite stupidity in the bird, and perhaps infinite credulity in the writer.

As there are few places where they can at once find proper food and security, so they generally continue near their old haunts, seldom wandering above twenty or thirty miles from home. As their food is replete with moisture, it enables them to live upon these dry plains, where there are scarcely any springs of water, a long time without drinking. Besides this, nature has given the males an admirable magazine for their security against thirst. This is a pouch, the entrance of which lies immediately under the tongue, and capable of holding near seven quarts of water. This is probably filled upon proper occasions, to supply the hen when sitting, or the young before they can fly.

They make no nest, but only scrape a hole in the earth, and sometimes line it with a little long grass or straw. There they lay two eggs only, almost of the size of a goose-egg, of a pale olive brown, marked with spots of a darker colour. They hatch for about thirty days, and the young ones run about as soon as they are out of the shell.

It is said that when the persecuted mother is apprehensive of the hunters, and is disturbed from her nest, she takes her eggs under her wings, and transports them to a place of safety. The fact is, however, that following the instinct of all the birds of this kind, they generally make their nest in the corn, where they are almost certain of remaining undisturbed.

The bustard is not known in America.—Besides the delicacy of their flesh, the quills are valuable, as they make excellent pens, but they are still more esteemed by anglers who use them as floats; for, as they are spotted with black, the notion is, that these black spots appear as flies to the fish, which they rather allure than drive away by this appearance.

The *little bustard* differs only from the preceding in being of a smaller size, being not larger than a pheasant, or about seventeen inches in length. This species is found in many parts of Europe. It is, however, by no means common in France, and has only been met with three or four times in England.

There are six or seven species of foreign birds of this kind, two or three of which, particularly the *boubara* and the *rhaad*,

(both African birds), are crested, and different from ours by some varieties in their plumage.

THE COCK. This bird, though perhaps the most common of all, is by no means sufficiently known, except to those who have made the productions of nature their peculiar study. So great indeed is the variety in this race of animals, that even the naturalist himself finds it difficult to point out its distinctive characters. If we take for the mark of the genus its four toes, what then becomes of the peculiar species which has five on each foot? If the erect and peculiar position of the tail be assumed, there is a species wholly destitute of this character. If we would say that the cock is only feathered to the lower joint of the leg, there are some breeds which are feathered even to the toes, and that of Japan has feathers even to the very nails. In fine, if we would class him among granivorous birds, we must allow some latitude even in this, since he devours greedily not only earth worms, but in many cases both fish and flesh.

Of all birds the cock seems to be the oldest companion of mankind, to have been first reclaimed from the forest, and taken to supply the accidental failure of the luxuries or necessaries of life. As he is thus longest under the care of man, so perhaps he exhibits the greatest number of varieties, there being scarcely two birds of this species that exactly resemble each other in plumage and form.

It is not well ascertained when the cock was first made domestic in Europe; but it is generally agreed that we first had him in our western world from the kingdom of Persia. The cock is found wild in the island of Tinian, in many others of the Indian ocean, and in the woods on the coasts of Malabar; his plumage is black and yellow, and his comb and wattles yellow and purple. There is another peculiarity also in those of the Indian woods; their bones, which, when boiled with us, are white, as every body knows, in those are black as ebony. Whether this tincture proceeds from their food, as the bones are tinctured red by feeding upon madder, we leave to the discussion of others: satisfied with the fact, let us decline speculation.

In their first propagation in Europe, there were distinctions then that now subsist no longer. The ancients esteemed those fowls whose plumage was reddish as invaluable; but as for the white it was considered as utterly unfit for domestic purposes. These they regarded as subject to become a prey to rapacious birds; and less fruitful than the former. No animal in the world has greater courage than the cock, when

opposed to one of his own species: and in every part of the world where refinement and polished manners have not entirely taken place, cock-fighting is a principal diversion. In China, India, the Philippine Islands, and all over the east, cock-fighting is the sport and amusement even of kings and princes. With us it is declining every day; and it is to be hoped it will in time become only the the pastime of the lowest vulgar. It is the opinion of many that we have a bolder and more valiant breed than is to be found elsewhere; but the truth is, they have cocks in China as bold, if not bolder than ours; and, what would still be considered as valuable among cockers here, they have strength with less weight.

The egg of a common hen weighs one ounce six drams. Upon breaking the shell, a fine membrane is found, which lines the shell; next to this is the external white, which is the shape of the egg, and then the internal white, which is rather rounder, and which incloses the yolk, which is quite round. Each of these parts is contained in a fine membrane.

With respect to the pretended cocks eggs, which are said to be without a yolk, and which, if set under a hen, credulity reports as likely to produce a serpent, they are no other than the first production of a pullet too young for laying, or the last effort of an old hen, which has been exhausted by her own fecundity.

The hen seldom clutches a brood of chickens above once a season, though instances have been known in which they have produced two. The number of eggs a domestic hen will lay in the year are above two hundred, provided she be well fed, and supplied with water and liberty. It matters not much whether she be trodden by the cock or not; she will continue to lay, although all the eggs of this kind can never by hatching be brought to produce a living animal.

As soon as an egg is laid, it begins to transpire, and loses, in a little time, some grains of its weight. If it continues exposed to the air, the inside hardens, and contracts a bad flavour; but, to prevent this effect, it is only necessary to cover the outside of the shell with a varnish, or with oily matter which shield it from the air. It is obvious, however, that the varnish must be removed if the eggs are designed for hatching.

The hen makes her nest without any care, if left to herself; a hole scratched in the ground, among a few bushes, is the only preparation she makes for this season of patient expectation. Nature, almost exhausted by its own fecundity, seems to inform her of the proper time for hatching, which she herself testifies by a clucking note, and by discontinuing

to lay. If left entirely to herself, the hen would seldom lay above twenty eggs in the same nest, without attempting to hatch them. While she sits, she carefully turns her eggs, and even removes them to different situations; till at length, in about three weeks, the young brood begin to give signs of a desire to burst their confinement.

The formation of the embryo is curious. During the first day's incubation, and even when the egg has been under the hen a few hours, the head of the chicken may be seen gradually uniting itself to the spine of the back. On the second day the first processes of the vertebræ may be discerned like so many small globules disposed on each side of the spine. The first commencement of the wings and the umbilical vessels may also be distinguished by their dark colour. The neck and the breast also shew themselves, and the head continues to increase in size. The third day the whole is more distinct and enlarged; and the heart, which is suspended at the opening of the breast, is observed to beat; veins and arteries may also be perceived about the brains, and the spinal marrow begins to extend itself through the spine. The eyes are considerably formed on the fourth day. The pupil, the crystaline and vitreous humours may be distinctly seen. The wings increase, the thighs appear, and the whole body begins in some degree to be covered with flesh. The fifth day the body is covered with a glutinous or unctuous flesh, the heart is retained within a very fine membrane, which also extends itself all over the breast. The sixth day the spinal marrow, in two divisions, continues to advance along the trunk; the liver, which at first was whitish, becomes of a darker hue; both ventricles of the heart beat, and the body of the chicken is covered with skin, in which may be already discerned the points of the feathers. The beak may be discovered on the seventh day, and the brain, the wings, the thighs, and even the feet have acquired a perfect form. The lungs appear at the end of the ninth day; their colour is whitish. On the tenth the muscles of the wings begin to form, the feathers continue to shoot out. It is not till the eleventh day that the arteries, which before were separate, unite to the heart. The rest of the process consists only in an increase and more perfect development of the several parts, till they acquire sufficient vigour to break the shell.

The strongest and best chickens generally are the first candidates for liberty: the weakest come behind, and some even die in the shell. When all are produced, the hen leads them forth to provide for themselves. Her affection and her pride seem then to alter her very nature, and correct her imperfec-

tions. No longer voracious or cowardly, she abstains from all food that her young can swallow, and flies boldly at every creature that she thinks is likely to do them mischief.

Ten or twelve chickens are the greatest number that a good hen can rear and clutch at a time; but as this bears no proportion to the number of her eggs, schemes have been imagined to clutch all the eggs of an hen, and thus turn her produce to the greatest advantage. The contrivance we mean, is the artificial method of hatching chickens in stoves, as is practised at Grand Cairo; or in a chymical elaboratory, properly graduated, as has been effected by Mr. Reaumur. At Grand Cairo, they thus produce six or seven thousand chickens at a time; where, as they are brought forth in their mild spring, which is warmer than our summer, the young ones thrive without clutching. But it is otherwise in our colder and unequal climate; the little animals may, without much difficulty, be hatched from the shell; but they almost all perish when excluded. The cock is a short-lived animal; but how long these birds live, if left to themselves, is not yet well ascertained by any historian. As they are kept only for profit, and in a few years become unfit for generation, there are few that, from mere motives of curiosity, will make the tedious experiment of maintaining a proper number till they die. Aldrovandus hints their age to be ten years *; and it is probable that this may be its extent.

THE TURKEY. If the common cock is the most useful bird in our poultry yard, the turkey is the most remarkable, as well for the beauty of the tail, as for the singular appearance of the head, and for those habits which are almost peculiar to itself. It is difficult to determine the natal place of any animal, the species of which is generally diffused; but the weight of testimony inclines us to the opinion that the turkey is a native of the New Continent, and that it was not brought into Europe till the discovery of that part of the world.

With us, when young, it is one of the tenderest of all birds: yet, in its wild state, it is found in great plenty in the forests of Canada, which are covered with snow above three parts of the year. In their natural woods they are found much larger than in their state of domestic captivity. They are much more beautiful also, their feathers being a dark gray,

* The Editor has known game cocks which were upwards of ten years old, though they had fought many battles, and consequently must have been greatly injured.

bordered at the edges with a bright gold colour. These the savages of the country weave into cloaks to adorn their persons, and fashion into fans and umbrellas, but never once think of taking into keeping animals that the woods furnish them with in sufficient abundance. Savage man seems to find a delight in precarious possession. The hunting of the turkey, therefore, makes one of his principal diversions; as its flesh contributes chiefly to the support of his family. When he has discovered the place of their retreat, which in general, is near fields of nettles, or where there is plenty of any kind of grain, he takes his dog with him, which is trained to the sport, and he sends him into the midst of the flock. The turkeys no sooner perceive their enemy, than they set off running at full speed, and with such swiftness, that they leave the dog far behind them: he follows, nevertheless, and, sensible they must soon be tired, as they cannot go full speed for any length of time, he, at last, forces them to take shelter in a tree, where they sit quite spent and fatigued, till the hunter comes up, and, with a long pole, knocks them down one after the other.

This manner of suffering themselves to be destroyed, argues no great instinct in the animal; and indeed, in their captive state, they do not appear to be possessed of much. They seem a stupid, vain, querulous tribe, apt enough to quarrel among themselves, yet without any weapons to do each other an injury. Every body knows the strange antipathy the turkey-cock has to red colour. But there is another method of encreasing the animosity of these birds against each other, which is often practised by boys, when they have a mind for a battle. This is no more than to smear over the head of one of the turkeys with dirt, and the rest run to attack it with all the speed of impotent animosity: nay, two of them thus disguised, will fight each other till they are almost suffocated with fatigue and anger.

But though so furious among themselves, they are weak and cowardly against other animals, though far less powerful than they. The cock often makes the turkey keep at a distance; and they seldom venture to attack him but with united force, when they rather oppress him by their weight, than annoy him by their arms. There is no animal, how contemptible soever, that will venture boldly to face the turkey-cock, that he will not fly from. On the contrary, with the insolence of a bully, he pursues any thing that seems to fear him, particularly lap-dogs and children, to both which he seems to have a peculiar aversion.

The female seems of a milder, gentler disposition. She lays eighteen or twenty eggs. Her young must be carefully fed with curd, chopped with dock-leaves; but as they grow older, they become more hardy, and follow the mother to considerable distances in pursuit of insect food, which they prefer to any other. When once grown up, turkeys are very hardy birds, and feed themselves at very little expence to the farmer. Those of Norfolk are said to be the largest of this kingdom, weighing from twenty to thirty pounds. There are places, however, in the East Indies, where they are known only in their domestic state, in which they grow to the weight of sixty pounds.

Besides the wild turkeys of America, there are a few foreign birds of this genus which deserve notice. The most singular of these is the *horned turkey* of Bengal. It is not quite so large as our turkey, which it resembles in most respects, except that the loose flap which hangs down its throat is blue and not red. The breast and upper part of the back is full red, and the other parts of the plumage brown marked with white spots. But its most remarkable characteristic consists in a fleshy, blue, callous substance like horn, which springs behind each eye, and gives it the full effect of a horned animal.

The *guan turkey* is a native of Brasil. It is not larger than a common turkey; the top of the head is furnished with long feathers, which the bird can erect as a crest at pleasure. The colour of the plumage is in general a brownish black.

The *yacou turkey*, which is a native of Cayenne, is also crested, as well as the *marail* turkey, which is found in the woods of Guiana. The plumage of these birds is also more splendid than that of ours.

THE PINTADA, OR GUINEA-HEN is a very remarkable bird, and in some measure unites the characteristics of the pheasant and the turkey. It has the fine delicate shape of the one, and the bare head of the other. To be more particular; it is about the size of the common hen, but as it is supported on longer legs, it looks much larger. It has a round back, with a tail turned downwards, like a partridge. The head is covered with a kind of casque; and the whole plumage is black or dark grey, speckled with white spots. It has wattles under the bill, which do not proceed from the lower chap, as in cocks, but from the upper, which gives it a very peculiar air; while its restless gait, and odd chuckling sound, distinguish it sufficiently from all other birds whatever.

It is well known all over Europe, and we find it in different countries called by different names, from the place whence

they had it. We have given it the name of that part of Africa from whence probably it was first brought.

In many parts of their native country they are seen in vast flocks together, feeding their young, and leading them in quest of food. All their habits are like those of the poultry kind, and they agree in every other respect, except that the male and female are so much alike, that they can hardly be distinguished asunder. Their eggs, like their bodies, are speckled; in our climate, they lay but five or six in a season; but they are far more prolific in their sultry regions at home.

There is a species of this bird with a very beautiful crest. There are also some other varieties which it would be tedious to describe.

The Grous. This genus of birds comprehends about seventeen species, foreign and domestic, all of which are distinguishable from other birds of the poultry order, by a naked scarlet skin above each eye. They have in other respects a great resemblance to our domestic fowl, but in reality are a very different race. They are by no means so numerous at present in any part of Europe, as we have reason to believe they once were. The piny forests and the barren heaths are their natural retreats; and since cultivation has increased in these countries, they are only to be found on such extensive wastes as the moors of Westmoreland, and the almost inaccessible mountains in the most northern parts of Great Britain.

The *wood grous*, or *cock of the wood* is the first of this genus in order and in consequence. It is about the size of a turkey, and frequently weighs near fourteen pounds; but the female is much smaller. The head and neck are ash-colour, crossed with black lines, the body and wings chesnut brown, and the breast of a very glossy blackish green. The legs are strong, and covered with brown feathers. The plumage of the female differs from this description, in being red about the throat, and having the head, neck and back crossed with red and black bars; the belly barred with orange and black, with the tips of the feathers white, as are also the tips of the shoulders.

The *cock* of the *wood*, when in the forest, attaches himself principally to the oak and the pine-tree; the cones of the latter serving for his food, and the thick boughs for an habitation. He feeds also upon ants' eggs, which seem a high delicacy to all birds of the poultry kind: cranberries are likewise often found in his crop. The female is much less than her mate, and entirely unlike him in plumage, so that she might be mistaken for a bird of another species. She seldom lays more than six or seven eggs, which are white, and marked

with yellow, of the size of a common hen's egg. She generally lays them in a dry place and mossy ground; and when she is obliged, during the time of incubation, to leave her eggs in quest of food, she covers them up so artfully, with moss or dry leaves, that it is extremely difficult to discover them.

As soon as the young ones are hatched, they are seen running with extreme agility after the mother, though sometimes they are not entirely disengaged from the shell. They soon come to perfection; they are an hardy bird, their food lies every where before them, and it would seem that they should increase in great abundance. But this is not the case; their numbers are thinned by rapacious birds and beasts of every kind, and still more by their own salacious contests. They fight each other like game-cocks; and are so inattentive to their own safety, that it often happens that two or three of them are killed at a shot. It is probable, that in these contests, the bird which comes off victorious takes possession of the female seraglio, as it is certain they have no faithful attachments. This species is now rarely found even in the Highlands of Scotland.

The *black grous*, or *black cock* is much more common. It is found in many parts of Europe, and in most of the moors in the north of England. Its name almost furnishes its description, since the whole body is black; but it has another remarkable characteristic, which is, that its tail is forked. It is rather larger than a common fowl, and is in length twenty-four inches. Their contests are so furious, that in Courland, Livonia, &c. it is a common method of taking them, to assemble them together, by imitating the crowing of a black cock, and by having a figure prepared to imitate that animal in all its motions. The grous, being collected in vast numbers from all parts, enter at first into a kind of sportive combat, which presently terminates in a real and bloody contest; when the combatants are so intent upon each other's destruction, that they fall an easy prey to their pursuers, and may even be knocked down with a stick. There is a variety of this species with a plain tail.

The *red grous*, or *moor-cock* are also tolerably plentiful in those parts where the *black grous* is to be found. It is rather smaller than the preceding species, being only fifteen inches and a half in length. The throat and back are reddish, with a black spot in each feather. The breast and belly are purplish brown, and the legs are covered with soft whitish feathers.

The *hazel grous* is a smaller bird, and appears of the same species with the former. It is a native of Germany.

The *pin-tailed grous*, so called from its narrow forked tail,

is also of the same species with our *red* grous. It is the size of a partridge, and is found in France, Spain, Barbary, &c.

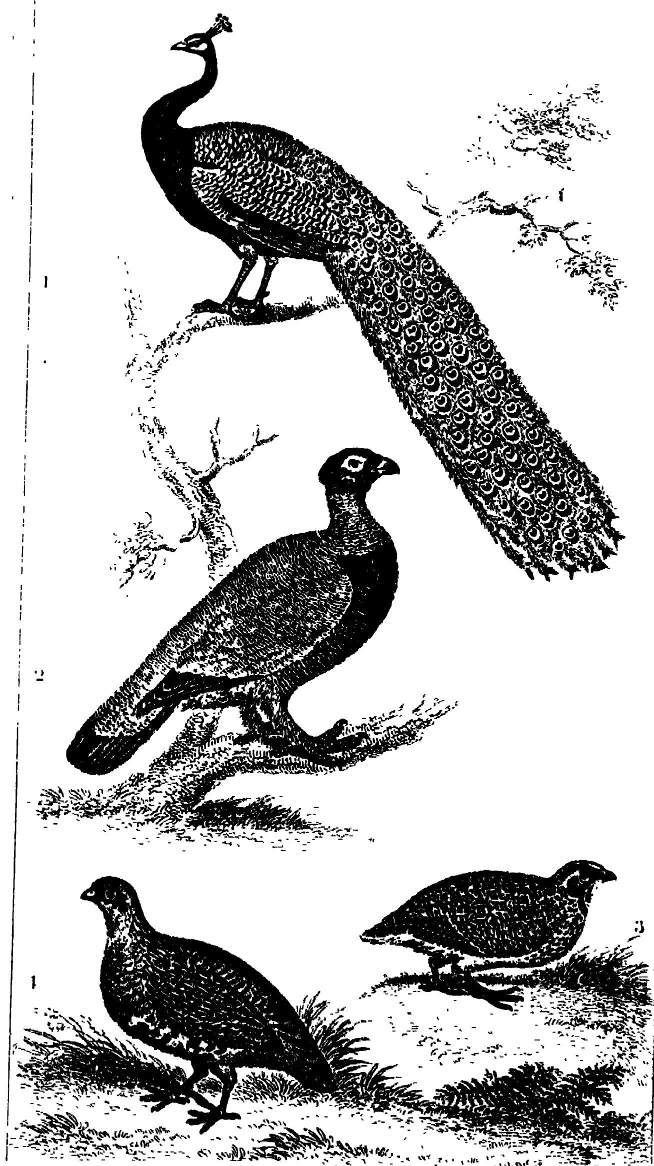
The *ptarmigan grous* is in length about fifteen inches. The bill is black, and the plumage is a pale ash-colour, elegantly mottled with dusky spots. It is found in all the northern parts of Europe, and in the Highlands of Scotland, Orkneys, &c.

The foreign birds of this genus have all the same manners as the preceding, and only differ occasionally in the plumage. There is a species in North America which is called the *ruffed grous,* and which is distinguished by a large ruff on the hind part of the neck, to be raised or depressed at pleasure; it has also the head adorned with a crest.

The Peacock, by the common people of Italy, is said to have the plumage of an angel, the voice of a devil, and the guts of a thief. Our first peacocks were brought from the East Indies; and we are assured that they are still found in vast flocks, in a wild state, in the Islands of Java and Ceylon. The peacock has in some countries been esteemed as an article of luxury; but whatever there may be of delicacy in the flesh of a young peacock, it is certain an old one is very indifferent eating.

Its fame for delicacy, however, did not continue very long; for we find in the time of Francis the First, that it was a custom to serve up peacocks to the tables of the great, with an intention not to be eaten, but only to be seen. Their manner was to strip off the skin; and then preparing the body with the warmest spices, they covered it up again in its former skin, with all its plumage in full display, and no way injured by the preparation. The bird thus prepared, was often preserved for many years without corrupting; and it is asserted of the peacock's flesh, that it keeps longer unputrefied than that of any other animal. To give a higher zest to these entertainments, on weddings particularly, they filled the bird's beak and throat with cotton and camphire, which they set on fire to amuse and delight the company.

Like other birds of the poultry kind, the peacock feeds upon corn; but its chief predilection is for barley. There is, however, scarcely any food that it will not at times covet and pursue. In the indulgence of these capricious pursuits, walls cannot easily confine it; it strips the tops of houses of their tiles or thatch, it lays waste the labours of the gardener, roots up his choicest seeds, and nips his favourite flowers in the bud. Thus its beauty ill recompenses for the mischief it occasions: and many of the more homely looking fowls are very deservedly preferred before it.



1. *Peacock* 2. *Wood Grous* 3. *Quail* 4. *Partridge*

The pea-hen seldom lays above five or six eggs in this climate before she sits. Aristotle describes her as laying twelve; and it is probable, in her native climate, she may be thus prolific: for it is certain, that in the forests where they breed naturally, they are numerous beyond expression. The bird lives about twenty years; and not till its third year has it that beautiful variegated plumage that adorns its tail.

The Pheasant. The name of this bird sufficiently indicates its origin. The *pheasant* is the bird of *Phasis*, a river of Colchis, in Asia Minor, whence they were first introduced into Europe.

Next to the peacock they are the most beautiful of birds, as well for the vivid colour of their plumes, as for their happy mixtures and varieties. It is far beyond the power of the pencil to draw any thing so glossy, so bright, or points so finely blending into each other. We are told that when Crœsus, king of Lydia, was seated on his throne, adorned with royal magnificence, and all the barbarous pomp of eastern splendour, he asked Solon if he had ever beheld any thing so fine! The Greek philosopher, no way moved by the objects before him, or taking a pride in his native simplicity, replied, that after having seen the beautiful plumage of the pheasant, he could be astonished at no other finery.

In fact, nothing can satisfy the eye with a greater variety and richness of ornament than this beautiful creature. The iris of the eyes is yellow; and the eyes themselves are surrounded with a scarlet colour, sprinkled with small specks of black. On the fore-part of the head there are blackish feathers mixed with a shining purple. The top of the head and the upper part of the neck are tinged with a darkish green that shines like silk. In some, the top of the head is of a shining blue, and the head itself, as well as the upper part of the neck, appears sometimes blue and sometimes green, as it is differently placed to the eye of the spectator. The feathers of the breast, the shoulders, the middle of the back, and the sides under the wings, have a blackish ground, with edges tinged of an exquisite colour, which appears sometimes black, and sometimes purple, according to the different lights it is placed in; under the purple there is a transverse streak of cold colour. The tail, from the middle feathers to the root, is about eighteen inches long; the legs, the feet, and the toes, are of the colour of horn. There are black spurs on the legs, shorter than those of a cock; there is a membrane that connects two of the toes together; and the male is much more beautiful than the female.

This bird, though so beautiful to the eye, is not less delicate when served up to the table. Its flesh is considered as the greatest dainty; and when the old physicians spoke of the wholesomeness of any viands, they made their comparison with the flesh of the pheasant. In the woods the hen-pheasant lays from eighteen to twenty eggs in a season; but in a domestic state she seldom lays above ten. Its fecundity when wild is sufficient to stock the forest; its beautiful plumage adorns it; and its flesh retains a higer flavour from its unlimited freedom.

The pheasant, when full grown, seems to feed indifferently upon every thing that offers. It is said by a French writer, that one of the king's sportsmen shooting at a parcel of crows, that were gathered round a dead carcass, to his great surprize upon coming up, found that he had killed as many pheasants as crows. It is even asserted by some, that such is the carnivorous disposition of this bird, that when several of them are put together in the same yard, if one of them happens to fall sick, or seems to be pining, that all the rest will fall upon, kill, and devour it.

There is a *bastard pheasant* which is of a mixed breed between the pheasant and the cock. The back is reddish, mottled with brown and white; the lower parts ash-coloured, spotted with brown. There is also a variety supposed to be produced between the turkey and the pheasant, and on that account called the *turkey pheasant*. It is, like the former, of a mingled colour.

There are about eight or ten foreign birds known of this genus. Among these the *painted*, or *golden pheasant of China*, is most conspicuous for its beauty. It is less than the common pheasant, not being more than two feet nine inches long. The general colour of the plumage is crimson; on the head is a beautiful yellow crest, the feathers of which appear like silk. The back and rump are yellow; the scapulars are blue, the quills brown marked with yellow; the tail is twenty-three inches in length, and the colour is chesnut, mottled with black. The hen is materially different, the general colour of her plumage being brown. It appears a hardy bird, and has been known to propagate with our common pheasant.

The *argus pheasant* is a magnificent bird. It receives its name from the quills being marked with eyes resembling those in the peacock's train. The top and hind part of the head and neck is a changeable blue; the back dusky, marked with reddish brown, the throat and breast a dull orange. It is the size of a cock turkey, and the two middle feathers of the tail are hree feet in length. This bird, as well as the former, and

the *superb pheasant*, the predominant colour of which is a beautiful green, is a native of China.

The *Impeyan pheasant* from Indostan, is larger than a common fowl. On the head is an erect crest of eighteen feathers, the longest three inches and a half in length. The feathers of the head and throat are green bronze, of the middle of the neck purple, with a copper gloss. The back and wings are purple, the belly is black, with a green gloss: the tail is a brown cinnamon colour.

There is another beautiful bird which some naturalists class with the pheasant, while others make it of a different genus, that is, the TRUMPETER. It has the breast of a fine glossy gilded green, though the general colour of the plumage is black. In other birds of this kind the colour varies a little, as the wings have a mixture of white, &c. The size is that of a large fowl.

This singular bird inhabits South America. It is a most familiar animal, as it will follow like a spaniel the person that takes care of it. It is remarkable for the sound it produces, which some imagine to proceed from the anus, or at least from the belly. At first a shrill sound seems to proceed from the mouth, which is answered by a noise from the belly, like the cooing of a dove, during which time the belly seems much agitated. It will feed on bread, fish, or flesh, and it is accounted as pleasant food as the pheasant.

THE CURASSOW is a bird which bears much resemblance to the pheasant, though naturalists have agreed in considering it as a distinct genus. It comprehends four or five species, with some varieties, but they are all of them foreign birds, and belong only to the warm climates of America. They are mostly about the size of a small turkey, and are generally distinguished by a crest of feathers, which curl at the ends. The most usual colour of the plumage is black, but this varies in the different species.

Of this the general colour is reddish brown, the bill yellow, with a brown tip, the sides of the head covered with black feathers, the neck encircled with alternate rings of black and white, and the tail barred with white.

There is another species which is called the *cushew curassow*, or *cushew bird*, from a large blue gibbosity, resembling a cushew nut, and as large as a pear, which is situated at the base of the forehead.

In Peru and Mexico these birds are very numerous, both in a wild and a tame state. The flesh is excellent.

OF PARTRIDGES there are more than twenty species, foreign and domestic, but they may all be arranged under two divisions, the grey and the red. The red partridge is the largest of the two, and often perches upon trees; the grey, which is the common partridge in England, is most prolific, and always keeps on the grouud.

The partridge seems to be a bird well known all over the world, as it is found in every country, and in every climate; as well in frozen regions about the pole, as the torrid tracts under the equator. It even seems to adopt itself to the nature of the climate where it resides. In Greenland, the partridge, which is brown in summer, as soon as the icy winter sets in, begins to take a covering suited to the season; it is then clothed with a warm down beneath; and its outward plumage assumes the colour of the snows amongst which it seeks its food. The manners of the partridge in most circumstances, resemble all those of poultry in general; but their cunning and instinct seem superior to those of the larger kinds. Perhaps, as they live in the very neighbourhood of their enemies, they have more frequent occasion to put their little arts in practice, and learn, by habit, the means of evasion or safety. Whenever, therefore, a dog or other formidable animal approaches their nest, their female uses every means to draw him away. She keeps just before him, pretends to be incapable of flying, just hops up, and then falls down before him, but never goes off so far as to discourage her pursuer. At length, when she has drawn him entirely away from her secret treasure, she at once takes wing and leaves him to gaze after her, in despair.

After the danger is over, and the dog withdrawn, she then calls her young, who assemble at once at her cry, and follow where she leads them. There are generally from ten to fifteen in a covey; and, if unmolested, they live from fifteen to seventeen years.

The *francolin*, is one of the most beautiful species of partridge. It is sometimes found in the South of Spain, but is very common in Barbary.

There is also a *bare-necked partridge* and a species with a hackle like that of a cock.

THE QUAIL is a bird much smaller than any of the former, being not above half the size of a partridge. The feathers of the head are black, edged with rusty brown; the breast is of a pale yellowish red, spotted with black; the feathers on the back are marked with lines of pale yellow, and the legs are of a pale hue.

The quail is by all known to be a bird of passage; and yet, if we consider its heavy manner of flying, and its dearth of plumage, with respect to its corpulence, we shall be surprised how a bird so apparently ill qualified for migration, should take such extensive journeys. Nothing, however, is more certain. "When we sailed from Rhodes to Alexandria," says Bellonius, "about autumn, many quails flying, from the "north to the south, were taken in our ship; and sailing at "spring-time the contrary way, from the south to the north, I "observed them on their return, when many of them were taken "in the same manner." This account is confirmed by many others; who aver, that they chuse a north wind for these adventures; the south being very unfavourable, as it retards their flight, by moistening their plumage. They then fly two by two; continuing, when their way lies over land, to go faster by night than by day: and to fly very high, to avoid being surprised, or set upon by birds of prey. It is now, however, asserted by some, that the quail only migrates from one province of a country to another. For instance, that in England, they fly from the inland counties, to those bordering on the sea, and continue there all the winter.

These birds are much less prolific than the partridge; seldom laying more than six or seven whitish eggs, marked with ragged, rust-coloured spots. Quail-fighting was a favourite amusement among the Athenians; they abstained from the flesh of this bird, deeming it unwholesome, as supposing that it fed upon the white hellebore; but they reared great numbers of them, for the pleasure of seeing them fight; and staked sums of money, as we do with cocks, upon the success of the combat. Fashion, however, has at present changed with regard to this bird; we take no pleasure in its courage, but its flesh is considered as a very great delicacy.

In South America there are crested quails; and in different parts of the world their plumage greatly varies. Ten or twelve different species have been enumerated: but the common quail only is known in France and England.

The Doves, or Pigeons are by some naturalists made a distinct order of birds, and indeed it must be confessed that the pigeon has little affinity with any of the preceding, except its domestic habits, and its utility to man. As the order, however, consists of too small a number of species, and those too well known to require a distinct chapter, we shall add whatever occurs upon the subject to the present section of our ornithology.

THE TAME PIGEON, and all its beautiful varieties, is said to derive its origin from the stock dove, the English name, implying its being the stock or stem whence the other domestic kinds have been propagated. This bird, in its natural state, is of a deep bluish ash-colour; the breast dashed with a fine changeable green and purple; its wings marked with two black bars; and the tail barred near the end with black. These are the colours of the pigeon in a state of nature; and from these simple tints has man by art propagated a variety that words cannot describe, nor even fancy suggest. However, nature still perseveres in her great outline; and though the form colour, and even the fecundity of these birds may be altered by art, yet their natural manners and inclinations continue still the same.

The dove-house pigeon, as is well known, breeds every month; it lays two white eggs, which most usually produce young ones of different sexes. From three or four o'clock in the evening, till nine the next day, the female sits on the eggs; she is then relieved by the male, who takes his place from ten till three,* while his mate is feeding abroad. In this manner they sit alternately till the young are excluded, which is from eighteen to twenty days, according to the warmth of the season. If, during this term, the female delays to return at the expected hour, the male follows and drives her to the nest; and, should he in his turn be dilatory, she retaliates with equal severity.

* The hen pigeon is, however, so constant to her eggs, that one, whose legs were frozen and dropped off, continued to sit, notwithstanding the pain which she endured with the loss of her limbs, till her young were hatched. Her legs were frozen by the nest being too near the entrance of the dove-cote, and consequently exposed to the cold air.

The young ones when hatched require no food for the three first days, only wanting to be kept warm, which is an employment the female takes entirely upon herself. During this period she never stirs out, except for a few minutes to take a little food. From this they are fed for eight or ten days, with corn or grain of different kinds, which the old ones gather in the fields, and keep treasured up in their crops, whence they throw it up again into the mouths of their young ones, who very greedily demand it.

So great is the produce of this bird in its domestic state, that near fifteen thousand may, in the space of four years, be produced from a single pair. Those pigeons which are called carriers, and are used to convey letters, are easily distinguished from all others by their eyes, which are compassed about with

a broad circle of naked white skin, and by being of a dark blue or blackish colour. It is from their attachment to their native place, and particularly where they have brought up their young, that these birds are employed in several countries as the most expeditious carriers. They are first brought from the place where they were bred, and whither it is intended to send them back with information. The letter is tied under the bird's wing, and, after feeding it well, lest it should stop by the way to eat, it is let loose, to return. The little animal no sooner finds itself at liberty, than its passion for its native spot directs all its motions. It is seen, upon these occasions, flying directly into the clouds to an amazing height; and then, with the greatest certainty and exactness, directing itself by some surprising instinct towards home, which lies sometimes at many miles distance. It is said, that in the space of an hour and a half, they sometimes perform a journey of forty miles; and Thevenot relates, that they commonly travel from Aleppo to Alexandria, above eighty-eight miles, in less than six hours.

The varieties of the tame pigeon are so numerous, that it would be a vain attempt to mention them: so much is the figure and the colour of this bird under human controul, that pigeon-fanciers, by coupling a male and female of different sorts, can breed them, as they express it, to a feather. Hence we have the various names of croppers, carriers, jacobines, powters, runts, tumblers, turbits, &c. There are many species of the wild pigeon differing from the stock-dove. The RING-DOVE is of the number; a good deal larger than the former, and building its nest with a few dry sticks in the boughs of trees. This seems a bird much fonder of its native freedom than the former: and attempts have been frequently made to render it domestic: but they have hitherto proved fruitless; for though their eggs have been hatched by the tame pigeon in a dove-house, yet, as soon as they could fly, they always betook themselves to the woods where they were first produced.

There are a variety of foreign birds, which belong to the pigeon species, but none of them are remarkable enough to require insertion in this abridgement, except that which is denominated by Edwards the *large crowned pigeon of the East Indies*. Though as large as a turkey, this bird evidently belongs to the pigeon species. It has the beak, the head, the legs, the form, the voice, and manners of this species. It is a native of the Isle of Banda. There appears no distinction between the males and the females, and the latter do not lay in these cold climates.

The *lesser crowned pigeon* is also a native of India. It is the size of a common pigeon. The head and neck of this bird are black; the back, rump, and tail a deep green; the breast and belly, violet, and the crest a gilded red.

THE TURTLE-DOVE is a smaller, but a much shyer bird than any of the former. It may easily be distinguished from the rest by the iris of the eye, which is of a fine yellow, and by a beautiful crimson circle that encompasses the eye-lids. The fidelity of these birds is noted; and a pair being put in a cage, if one dies, the other will not survive it. The turtle-dove is a bird of passage, and few or none remain in our northern climates in winter. They fly in flocks when they come to breed here in summer, and delight in open, mountainous, sandy countries. They build their nests in the midst of woods; but may yet be tamed, and even brought to propagate in dove-houses like the tame-pigeon, and several varieties are produced in this artificial existence. They will even pair with pigeons, and thus produce a mixed one.

Among the foreign birds of this species, the most remarkable is the *ground turtle*, or *small turtle dove*, of St. Domingo. It is not above the size of the common crested lark, or a little better than six inches long. The upper parts of the body are ash-coloured, the lower parts reddish spotted with brown. It is excellent eating, and on this account, and for its size, it has acquired the name of ortolan, being nearly about the same weight as the European ortolan.

CHAP. III.

Of Birds of the Pie Order—The Raven—The Carrion CROW—*The Rook—The Royston Crow—The Jackdaw—The Cornish Chough—The Hottentot Crow—The Bald Crow—The variegated, and white-breasted Crow—The Magpie—The Jay—The Chinese, Peruvian, Canada, Siberian, and yellow-bellied Jays—The Nutcracker—The* ROLLER—*The* HOOPOE—*The Promerops—The* KING'S FISHER—*The* CUCKOO—*The* WOODPECKER—*The* ORIOLE—*The Nuthatch—The* BEE-EATER—*The* WRYNECK—*The* CREEPER—*The* TOUCAN—*The* MOTMOT—*The* HORNBILL—*The Rhinoceros, Helmet, and Pied Hornbills—The* PARROT—*The Macow, the Lory, the Parakeet, and Cockatoo—The* ANI—*The* WATTLE *Bird—The* CRACKLE—*The* BIRD *of* PARADISE—*The King Bird of Paradise—The magnificent Bird of Paradise—The* BEEF-EATER—*The* CURACUI—*The* BARBET—*The* JACAMAR—*The* TODY—*The* HUMMING-BIRD.

The Order of Pies.

THE CROW.

THE *raven*, the *carrion-crow*, and the *rook*, are birds so well known, that a long description would but obscure our ideas of them. The raven is the largest of the three, and distinguished from the rest, not only by the size, but by his bill being somewhat more hooked than that of the rest. As for the carrion-crow and the rook, they so strongly resemble each other, both in make and size, that they are not easily distinguished asunder. The chief difference to be found between them lies in the bill of the rook; which, by frequently being thrust into the ground to fetch out grubs and earth-worms, is bare of feathers as far as the eyes, and appears of whitish colour. It differs also in the purple splendour or gloss of its feathers, which in the carrion-crow are of a more dirty black. Nor is it amiss to make these distinctions, as the rook has but too frequently suffered for its similitude to the carrion-crow; and thus an harmless bird, that feeds only upon insects and corn, has been destroyed for another that feeds upon carrion, and is often destructive among young poultry.

The *raven* is a bird found in every region of the world; strong and hardy, he is uninfluenced by the change of the weather; and when other birds seem numbed with cold, or

pining with famine, the raven is active and healthy, busily employed in prowling for prey, or sporting in the coldest atmosphere. As the heats at the line do not oppress him, so he bears the cold of the polar countries with equal indifference. He is sometimes indeed seen milk-white, and this may probably be the effect of the rigorous climates of the north. A raven may be reclaimed to almost every purpose to which birds can be converted. He may be trained up for fowling like an hawk; he may be taught to fetch and carry like a spaniel; he may be taught to speak like a parrot; but the most extraordinary of all is, that he can be taught to sing like a man. I have heard (says a modern author) a raven sing the Black Joke with great distinctness, truth, and humour.

Indeed, when the raven is taken as a domestic, he has many qualities that render him extremely amusing. Busy, inquisitive, and impudent, he goes every where, affronts and drives off the dogs, plays his pranks on the poultry, and is particularly assiduous in cultivating the good-will of the cook maid, who seems to be the favourite of the family. But then, with the amusing qualities of a favourite, he often also has the vices and defects. He is a glutton by nature, and a thief by habit. He does not confine himself to petty depredations on the pantry or the larder; he soars at more magnificent plunder; at spoils which he can neither exhibit nor enjoy; but which, like a miser, he rests satisfied with having the satisfaction of sometimes visiting and contemplating in secret. A piece of money, a tea-spoon, or a ring, are always tempting baits to his avarice; these he will slily seize upon, and, if not watched, will carry to his favourite hole.

In his wild state, the raven is an active and greedy plunderer. Nothing comes amiss to him. If in his flights he perceives no hopes of carrion, and his scent is so exquisite, that he can smell it at a vast distance, he then contents himself with more unsavory food, fruits, insects, and the accidental desert of a dunghill. This bird chiefly builds its nest in trees, and lays five or six eggs of a pale green colour, marked with small brownish spots.

Notwithstanding the injury these birds do in picking out the eyes of sheep and lambs, when they find them sick and helpless, a vulgar respect is paid them as being the birds that fed the prophet Elijah in the wilderness. This prepossession in favour of the raven, is of very ancient date, as the Romans themselves, who thought the bird ominous, paid it, from motives of fear, the most profound veneration. One of these that had been kept in the temple of Castor, as Pliny informs us, flew down into the shop of a taylor, who took much

delight in the visits of his new acquaintance. He taught the bird several tricks; but particularly to pronounce the name of the emperor Tiberius and the whole royal family. The taylor was beginning to grow rich by those who came to see this wonderful raven, till an envious neighbour, displeased at the taylor's success, killed the bird, and deprived the taylor of his future hopes of fortune. The Romans, however, took the poor taylor's part; they punished the man who offered the injury, and gave the raven all the honours of a magnificent interment.

Birds in general live longer than quadrupeds; and the raven is said to be one of the most long-lived of the number. Some of them have been known to live near an hundred years. This animal, indeed, seems possessed of those qualities that generally produce longevity, a good appetite, and great exercise.

The *carrion-crow* resembles the raven in its appetites, laying, and manner of bringing up its young. It only differs in being less docile, and less favoured by mankind.

The *rook* leads the way in another, but a more harmless train, that have no carnivorous appetites, but only feed upon insects and corn. The *Royston crow* is about the size of the two former. The breast, belly, back, and upper part of the neck, being of a pale ash-colour; the head and wings glossed over with a fine blue. He is a bird of passage, visiting this kingdom in the beginning of winter, and leaving it in the spring. He breeds, however, in different parts of the British dominions; and his nest is common enough in trees in Ireland.

The *jackdaw* is black like all the former, but ash-coloured on breast and belly. He is not above the size of a pigeon. He is docile and loquacious. His head being large for the size of his body, which, as has been remarked, argues him ingenious and crafty. He builds in steeples, old castles, and high rocks, laying five or six eggs in a season. The *red legged crow*, or *Cornish chough* is like a jackdaw, but larger, and almost the size of a crow. The feet and legs are long, like those of a jackdaw, but of a red colour; and the plumage is black all over. It frequents rocks, old castles, and churches, by the sea-side, like the daw; and with the same noisy assiduity. It is only seen along the western coasts of England. These are birds very similar in their manners, feeding on grain and insects, living in society, and often suffering general castigation from the flock for the good of the community.

There are several foreign birds which bear a near relation to the crow. The *Hottentot crow* of the Cape of Good Hope

is remarkable for two bunches of stiff hair about three inches long, which spring out from the corners of his mouth, and which have the full effect of a pair of whiskers. The bird itself is not above the size of a blackbird.

The *Bald crow*, which inhabits Cayenne, is as singular for an opposite quality, which is, that the fore part of the head, as far as the crown, is entirely bare of feathers.

In Mexico there are *Pied ravens*, and in Norway and Iceland there are some which are white. The *variegated crow* of Ferroe in its plumage somewhat resembles the magpie; and the *white breasted crow*, which inhabits China, Indostan and Africa, is still more beautiful. There are almost as many varieties in the Daw species.

The *Magpie* is too well known to need a description. Indeed, were its other accomplishments equal to its beauty, few birds could be put in competition. Its black, its white, its green and purple, with the rich and gilded combination of the glosses on its tail, are as fine as any that adorn the most beautiful of the feathered tribe. But it has too many of the qualities of a beau, to depreciate these natural perfections: vain, restless, loud, and quarrelsome, it is an unwelcome intruder every where; and never misses an opportunity, when it finds one, of doing mischief.

The magpie bears a great resemblance to the butcher-bird in its bill, which has a sharp process near the end of the upper chap, as well as in the shortness of its wings, and the form of the tail, each feather shortening from the two middlemost. But it agrees still more in its food, living not only upon worms and insects, but also upon small birds, when they can be seized. A wounded lark, or a young chicken separated from the hen, are sure plunder; and the magpie will even sometimes set upon and strike a blackbird.

The same insolence prompts it to seize the largest animals when its insults can be offered with security. They often are seen perched upon the back of an ox or a sheep, pecking up the insects to be found there; chattering and tormenting the poor animal at the same time, and stretch out their necks for combat, if the beast turns its head backward to apprehend them. They seek out also the nests of birds; and, if the parent escapes, the eggs make up for the deficiency: the thrush and the blackbird are but too frequently robbed by this assassin, and this in some measure causes their scarcity.

No food seems to come amiss to this bird; it shares with ravens in their carrion, with rooks in their grain, and with the cucko in their eggs: but it seems possessed of a providence seldom usual with gluttons: for when it is satisfied for the

present, it lays up the remainder of the feast for another occasion. It will even in a tame state hide its food when it has done eating, and after a time return to the secret board with renewed appetite and vociferation.

In all its habits it discovers a degree of instinct unusual to other birds. Its nest is not less remarkable for the manner in which it is composed, than for the place the magpie takes to build it in. The nest is usually placed conspicuous enough, either in the middle of some hawthorn bush, or on the top of some high tree. The place, however, is always found difficult of access; for the tree pitched upon usually grows in some thick hedge-row, fenced by brambles at the root; or sometimes one of the higher bushes is fixed upon for the purpose. When the place is thus chosen as inaccessible as possible to men, the next care is to fence the nest above, so as to defend it from all the various enemies of the air. The kite, the crow, and the sparrow-hawk, are to be guarded against; as their nests have been sometimes plundered by the magpie, so it is reasonably feared that they will take the first opportunity to retaliate. To prevent this, the magpie's nest is built with surprising labour and ingenuity.

The body of the nest is composed of hawthorn branches; the thorns sticking outward, but well united together by their mutual insertions. Within it is lined with fibrous roots, wool, and long grass, and then nicely plaistered all round with mud and clay. The body of the nest being thus made firm and commodious, the next work is to make the canopy which is to defend it above. This is composed of the sharpest thorns, woven together in such a manner as to deny all entrance except at the door, which is just large enough to permit egress and regress to the owners. In this fortress the male and female hatch and bring up their brood with security, sheltered from all attacks but those of the climbing school-boy, who often finds his torn and bloody hands too dear a price for the eggs or the young ones. The magpie lays six or seven eggs, of a pale green colour, spotted with brown.

This bird, in its domestic state, preserves its natural character with strict propriety. The same noisy, mischievous habits attend it to the cage that marked it in the woods; and being more cunning, so it is a more docile bird than any other taken into keeping. Those who are desirous of teaching it to speak, have a foolish custom of cutting its tongue, which only puts the poor animal to pain, without improving its speech in the smallest degree. Its speaking is sometimes very distinct; but its sounds are too thin and sharp to be an

exact imitation of the human voice, which the hoarse raven and parrot can counterfeit more exactly.

There are some foreign birds of this species, but they are scarcely deserving of notice.

To this tribe we may refer the *Jay*, which is one of the most beautiful of the British birds. The forehead is white, streaked with black; the head is covered with very long feathers, which it can erect into a crest at pleasure; the whole neck, back, breast, and belly, are of a faint purple, dashed with grey; the wings are most beautifully barred with a lovely blue, black, and white; the tail is black, and the feet of a pale brown. Like the magpie it feeds upon fruits, will kill small birds, and is extremely docile.

Many of the foreign birds of the jay kind are exceedingly beautiful. The *Chinese Jay* is of two kinds, the *red-billed* and that with a bluish bill. They are both elegant birds, their plumage being finely-varied with patches of a fine velvet black, particularly about the head and throat. The *Peruvian* jay is of a tender green, which by insensible shades, assumes a bluish cast in different parts of the body. The *Brown jay* of *Canada* and the *Siberian jay* are less remarkable. At *Cayenne* there are two other remarkable species, one of which has three white spots on each side of the head; and the other, which is called the *yellow bellied jay*, is further distinguished by a golden streak upon the crown of the head.

The *Nut-cracker* is by some naturalists considered as of a distinct genus, by others it is classed with the crow; though in its manners it most resembles the jay, laying up a store of nuts and acorns, and inhabiting the pine forests like that bird. It is the size of a magpie, and the general colour of its plumage is a rusty brown, marked with triangular white spots. They are very plenty in Germany, and are rarely seen in England.

THE ROLLER is a genus of birds not less conspicuous for beauty than any that has been mentioned. The *Garrulous Roller*, so called from its chattering noise, is the only species with which the inhabitants of Europe are acquainted. It is the size of a jay. The head, neck, and breast are of a light bluish green; the upper part of the body of a reddish brown; the tail is forked, and of a light blue; the legs are remarkably short. It is a bird of passage, which, however, seldom visits England.

The *Chinese*, the *Cayenne*, and the *Abyssinian Rollers* are all



1. *Hoopoe* 2. *Promerops* 3. *Woodp.*
4. *Kingfisher.*

distinguished by the brilliancy of their plumage, but differ little in any material respect from the preceding.

If we ascend in the scale of beauty, the next bird that demands our attention is the HOOPOE. Of this there is only one species known to the Europeans, which is however diffused over the whole of the Old Continent. It weighs about twelve ounces, and is twelve inches in length, the extent of its wings being nineteen inches across. The bill is long and black. The neck is pale reddish brown; the breast and belly white; the lesser coverts of the wing light brown; the back, scapulars and wings crossed with black and white, the rump white, and the tail white, marked with black in the form of a crescent. But the distinguishing character is a beautiful crest of about two inches high, which is of a pale orange tipped with black. The food of this bird is insects. It is in some places accounted good eating.

In *Madagascar* there is found another species of Hoopoe. The *Promerops* also, which is found in South America and the southern parts of Africa and India, is generally considered as a species of Hoopoe. The body is the size of a pigeon, though the whole bird including the tail, measures nearly four feet. The head and neck, and upper part of the belly, are of a shining green; the rest of the plumage black with a gloss of violet. The scapular feathers, which are erect, are black, with the ends and under parts shining green. Besides these, on each side of the tail are six falci-form feathers which hang over each thigh. This bird is a native of New Guinea.

THE KING-FISHER is a bird better known in England than the preceding, and is perhaps the most elegant bird which is produced in these northern climates.

The king-fisher is not much larger than a swallow; its shape is compact; the legs however are disproportionably small, and the bill disproportionably long; it is two inches from the base to the tip; the upper chap black, and the lower yellow; but the colours of this bird atone for whatever is inelegant in its form; the crown of the head and the coverts of the wings are of a deep blackish green, spotted with bright azure; the back and tail are of the most resplendent azure; the whole under the side of the body is orange coloured; a broad mark of the same passes from the bill beyond the eyes; beyond that is a large white spot: the tail is short, and consists of twelve feathers of a rich deep blue; the feet are of a reddish yellow, and the three joints of the utmost toe

adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive size, the slender short legs, and the beautiful colours of this bird, no person would suppose it one of the most rapacious little animals that skims the deep. Yet it is for ever on the wing, and feeds on fish, which it takes in surprising quantities, when we consider its size and figure. It chiefly frequents the banks of rivers, and takes its prey after the manner of the osprey, balancing itself at a certain distance above the water for a considerable space, then darting into the deep, and seizing the fish with inevitable certainty. While it remains suspended in the air, in a bright day, the plumage exhibits a beautiful variety of the most dazzling and brilliant colours.

The king-fisher builds its nest by the river-side, in a hole which it burrows out itself, or in the deserted hole of a rat. In these holes, which, from the remains of fish brought there, are very fœtid, the king-fisher is often found with from five eggs to nine. There the female continues to hatch even though disturbed; and though the nest be robbed, she will again return and lay there. The male, whose fidelity exceeds even that of the turtle, brings her large provisions of fish while she is thus employed; and she, contrary to most other birds, is found plump and fat at that season.

The ancients have had their fables concerning this bird, and so have the modern vulgar. It is an opinion generally received among them, that the flesh of the king-fisher will not corrupt, and that it will even banish all vermin. This has no better foundation than that which is said of its always pointing, when hung up dead, with its breast to the north. The only truth that can be affirmed of this bird when killed is, that its flesh is utterly unfit to be eaten; while its beautiful plumage preserves its lustre longer than that of any other bird we know.

Of this bird there are about thirty-six species foreign and domestic.

THE CUCKOO. From these elegant animals we proceed to one, which, if it cannot boast much variety and beauty of plumage, is yet conspicuous for the lightness and elegance of its form, and for its peculiar habits. This singular bird, which is somewhat less than a pigeon, and of a greyish colour, is distinguished from all other birds, by its round prominent nostrils. Having disappeared all the winter, it discovers itself in our country early in the spring, by its well known call. Its note is heard earlier or later as the season seems to be

more or less forward, and the weather more or less inviting. From the cheerful voice of this bird the farmer may be instructed in the real advancement of the year. His note is pleasant though uniform; and, from an association of ideas, seldom occurs to the memory without reminding us of the sweets of summer.

The female cuckoo makes no nest of her own. She repairs for that purpose, to the nest of some other bird, generally the water-wagtail or hedge sparrow, and having devoured the eggs of the owner, lays her own in their place. She usually lays but one, which is speckled and of the size of a blackbird's. This the fond foolish bird hatches with great assiduity, and, when excluded, finds no difference in the great ill-looking changeling from her own. To supply this voracious creature, the credulous nurse toils with unusual labour, no way sensible that she is feeding up an enemy to her race, and one of the most destructive robbers of her future progeny.

It was once doubted, whether these birds were carnivorous; but Reaumur was at the pains of breeding up several, and found that they would feed upon bread or corn; but flesh and insects were their favourite nourishment. Their gluttony is not to be wondered at, when we consider the capacity of their stomach, which is enormous, and reaches from the breast-bone to the vent.

The cuckoo when fledged and fitted for flight, follows its supposed parent but for a little time; its appetites for insect food increasing, as it finds no great chance for a supply in imitating its little instructor, it parts good friends, the step-child seldom offering any violence to its nurse. Nevertheless, all the little birds of the grove seem to consider the young cuckoo as an enemy, and revenge the cause of their kind by their repeated insults. They pursue it whenever it flies, and oblige it to take shelter in the thickest branches of some neighbouring tree. All the smaller birds form the train of its pursuers: but the wry-neck, in particular, is found the most active in the chase; and thence it has been called by many the cuckoo's attendant and provider. But it is very far from following with a friendly intention; it only pursues as an insulter, or a spy, to warn all its little companions of the cuckoo's depredations.

Such are the manners of this bird while it continues to reside, or to be seen amongst us. But early, at the approach of winter, it totally disappears, and its passage can be traced to no other country. Some suppose that it lies hid in hollow trees; and others that it passes into warmer climates. Which of these opinions is true is very uncertain, as there are no

facts related on either side that can be totally relied on. To support the opinion that they remain torpid during the winter, at home, Willoughby introduces the following story, which he delivers upon the credit of another. "The servants of "a gentleman, in the country, having stocked up, in one of "their meadows, some old dry rotten willows, thought "proper, on a certain occasion, to carry them home. In "heating a stove, two logs of this timber were put into the "furnace beneath, and fire applied as usual. But soon, to "the great surprise of the family, was heard the voice of a "cuckoo, singing three times from under the stove. Wonder-"ing at so extraordinary a cry in winter time, the servants "ran and drew the willow logs from the furnace, and in the "midst, one of them saw something move: wherefore, tak-"ing an ax, they opened the hole, and thrusting in their "hands, first they plucked out nothing but feathers; after-"wards they got hold of a living animal; and this was the "cuckoo that had waked so very opportunely for its own "safety. It was, indeed," continues our historian, "brisk "and lively, but wholely naked and bare of feathers, and "without any winter provision in its hole. This cuckoo the "boys kept two years afterwards alive in the stove; but "whether it repaid them with a second song, the author of "the tale has not thought fit to inform us."

The most probable opinion on this subject is, that as quails and woodcocks shift their habitation in winter, so also does the cuckoo; but to what country it retires, or whether it has been ever seen on its journey, are questions that we are wholly incapable of resolving.

Of this bird there are many kinds in various parts of the world, not only differing in their colours but their size. Latham makes not less than forty species. There is a *large spotted cuckoo*, in the south of Spain; and at the Cape of Good Hope there is a black crested species. Only the common and spotted cuckoo have been seen in Europe.

THE WOODPECKERS. These birds live chiefly upon the insects contained in the body of trees; and for this purpose are furnished with a straight, hard, strong, angular and sharp bill, made for piercing and boring. They have a tongue of a very great length; round, ending in a sharp, stiff, bony thorn, dentated on each side, to strike ants and insects when dislodged from their cells. Their legs are short and strong, for the purposes of climbing. Their toes stand two forward, and two backward; which is particularly serviceable in holding by

branches of trees. They have hard stiff tails, to lean upon when climbing. They feed only upon insects, and want that intestine, which anatomists call the cœcum; a circumstance peculiar to this tribe only.

Of this bird there are more than fifty species with many varieties. They form large colonies in the forests of every part of the world. They are found from the size of a jackdaw to that of a wren, and differ greatly in colour and appearance; and agreeing only in the marks above-mentioned, or in those habits which result from so peculiar a conformation. There are about five species known to Europe, or at least in England, viz. the large *Black Woodpecker,* which is seventeen inches long, and is found in Germany; the *Green,* and three species of spotted. The Green *Wood-spite,* or *Wood-pecker* is called the Rain Fowl in some parts of the country; because, when it makes a greater noise than ordinary, it is supposed to foretel rain. It is about the size of a jay, and weighs six ounces; the throat, breast and belly are of a pale greenish colour; and the back, neck and covert feathers of the wings are full green. The *Great spotted-Wood-pecker* weighs about three ounces, and is the size of a black-bird, and nine inches in length. The crown of the head is black, with a bar of crimson on the hind part of it. On each side of the neck is a spot of white, the scapulars and wing coverts are white. The back and wings are black, and the breast is yellowish grey. The *Middle spotted Woodpecker* nearly resembles the preceding, but is smaller; and the *Lesser spotted Wood-pecker* is scarcely an ounce in weight, and has the upper parts of the body mottled with white. All these species feed upon insects, and particularly on those which are found in decaying trees.

The wood-pecker, however, does not confine its depredations solely to trees, but sometimes lights upon the ground, to try its fortune at an ant-hill. It first goes to their hills, which it pecks, in order to call them abroad; it then thrusts out its long red tongue, which being like a worm, and resembling their usual prey, the ants come out to settle upon in great numbers; however, the bird watching the properest opportunity, withdraws its tongue at a jerk, and devours the devourers. This stratagem it continues till it has alarmed their fears, or till it is quite satisfied.

As the wood-pecker is obliged to make holes in trees to procure food, so it is also to make cavities still larger to form its nest and to lay in. This is performed, as usual, with the bill; although some have affirmed that the animal uses its tongue, as a gimblet, to bore with. But this is a mistake; and those that are curious, may often hear the noise of the

bill making its way in large woods and forests. The wood-pecker chooses, however, for this purpose, trees that are decayed, or wood that is soft, like beech, elm and poplar. In these, with very little trouble, it can make holes as exactly round as a mathematician could with compasses. One of these holes the bird generally chuses for its own use, to nestle, and bring up its young in; but as they are easily made, it is delicate in its choice, and often makes twenty before one is found fit to give entire satisfaction.

The wood-pecker takes no care to line its nest with feathers or straw; its eggs are deposited in the hole, without any thing to keep them warm, except the heat of the parent's body. Their number is generally five or six; always white, oblong, and of a middle size. When the young are excluded, and before they leave the nest, they are adorned with a scarlet plumage under the throat, which adds to their beauty.

The foreign birds of this genus are too numerous to specify. Let us therefore instead of entering into the minuteness of description, select one as a specimen. The *Buff crested Wood-pecker* of Surinam, is in length twelve inches and a half. The whole head is crested, the fore part of which is black, the hinder part buff-coloured. The general colour of the plumage is brown black, but the sides of the neck and the breast are white streaked with black. The *Minute Wood-pecker* which inhabits Cayenne is only three inches and a half in length, or about the size of a wren.

Of the Oriole, there appears to be only one species known in Europe; this is by some termed the *Golden Oriole*. It is the size of a thrush, and has been called the golden thrush and the witwal. The head and whole body of the male is of a rich yellow; the bill red; from that to the eye a black line: the wings black, marked with a bar of yellow, as are the ends of the feathers. The tail is black with the end yellow. The body of the female is a dull green, with dusky wings and tail. The nest of this bird is of the shape of a purse, and rests upon the outermost twigs of tall trees. It is common in France, but has very rarely visited England.

America however is the country in which these birds are found in the greatest variety and the most perfect beauty. There are in fact upwards of forty species, most of which are natives of the new Continent. In Guiana and Brasil, the birds of this species take a different method to protect and hatch their nascent progeny. A traveller who walks into the forests of those countries, among the first strange objects that excite curiosity, is struck with the multitude of birds nests





1. Golden Oriole – 2. Indian Bee Eater –
3. Nests of Tropical Birds

hanging at the extremity of almost every branch. Many other birds build in this manner; but the chief of them are of the Oriole kind. In cultivated countries, a great part of the caution of the feathered tribe is to hide or defend their nests from the invasions of man, as he is their most dreaded enemy. But in the depth of those remote and solitary forests, where man is but seldom seen, if the monkey or the snake can be guarded against, the bird has no other enemies to fear. On the bananas and plantains of these regions, is seen the most various, and the most inimical assemblage of creatures that can be imagined. The top is inhabited by monkeys of some particular tribe, that drive off all others; lower down about the great trunk, numbers of the larger snakes are found patiently waiting till some unwary animal comes within the sphere of their activity; and at the edges of the tree hang these artificial nests in great abundance, inhabited by birds of the most delightful plumage.

The nest is usually formed in this manner: when the time of incubation approaches, they fly busily about, in quest of a kind of moss, called, by the English inhabitants of those countries, *old man's beard*. It is a fibrous substance, and not very unlike hair, which bears being moulded into any form, and suffers being glued together. This therefore, the little artist first glues by some viscous substance gathered in the forest, or sews with the leaves of the banana to the extremest branch of a tree; then building downward, and still adding fresh materials to those already procured, a nest is formed, that depends, like a pouch, from the point of the branch: the hole to enter at, is on the side; and all the interior parts are lined with the finer fibres of the same substance, which compose the whole.

Such is the general contrivance of these hanging nests, which are made, by some birds, with still superior art. A little bird of the Grosbeak kind, in the Philippine islands, makes its nest in such a manner, that there is no opening but from the bottom. At the bottom the bird enters, and goes up through a funnel, like a chimney, till it comes to the real door of the nest, which lies on one side, and only opens into this funnel.

THE NUTHATCH weighs near an ounce, and is five inches and three quarters in length. The bill is strong and strait, and three quarters of an inch long. The upper part of the plumage is of a fine bluish grey, a black stroke runs from the mouth to the eye. The cheeks are white and the breast and belly of a dull orange colour. This bird runs up and down

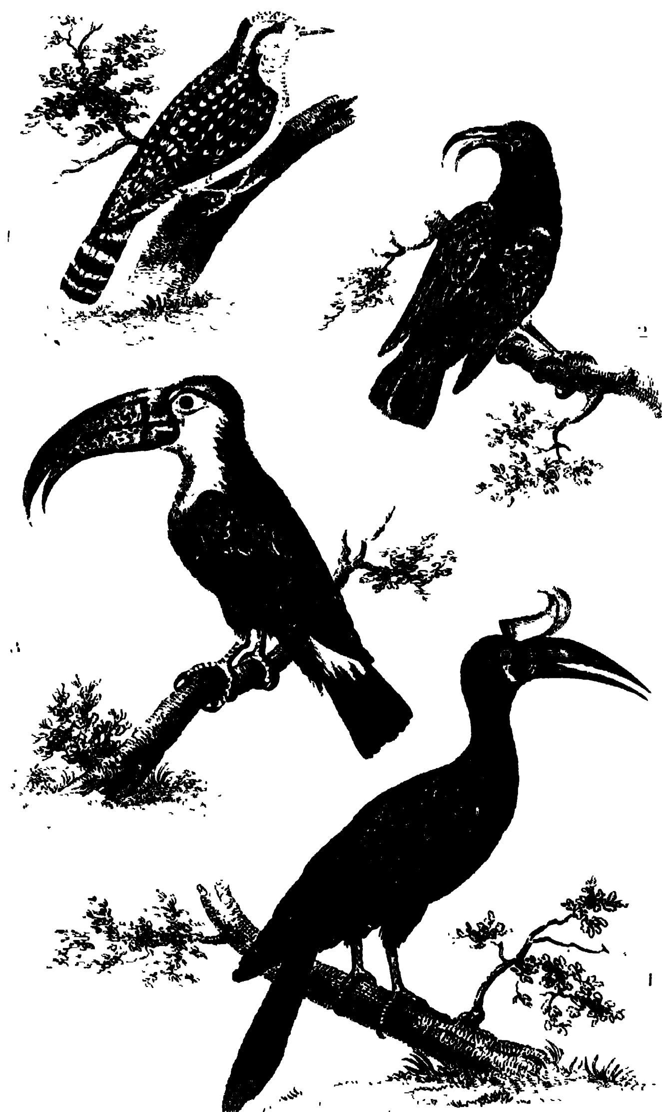
the bodies of trees like the wood-pecker. It feeds on insects and nuts, which it stores in the hollow parts of the tree. It is a pretty sight, says Willoughby, to see her fetch a nut out of her hoard, place it in a chink, and then standing above it, striking it with all its force till it breaks the shell and catches up the kernel. Doctor Plot says, that this bird by putting its bill into the crack of a tree can produce a violent sound, as if it was rending asunder, which may be heard at least one hundred and twenty yards.

In some countries this bird, from the noise which it produces in the manner above stated, is called the Loggerhead. There are about six foreign species.

The Bee-eater is well known on the continent of Europe, though it has never been seen in England. It is about ten inches in length. The forehead is of a blue green, the top of the head, and upper part of the back chesnut and green; the throat is yellow, and the under parts of the body bluegreen. Flocks of these birds are seen in Germany. It feeds chiefly upon insects, and is good food. There are about twenty different species foreign and domestic.

The Wryneck is a beautiful bird, though its colours are of the plainest kind. It is about the size of a lark. Its plumage in general is ash coloured, beautifully marked with black, but the breast and belly are lighter than the upper parts. Its bill is three quarters of an inch long, and the tongue is like a worm when extended. With this instrument it procures its food, which consists chiefly of ants. In England it is a bird of passage; at the end of summer it grows remarkably fat, and is on that account confounded with the Ortolan, and greatly celebrated among the connoisseurs in good eating. The young ones hiss in the nest like so many snakes, insomuch that the rustics are sometimes prevented plundering the nest, being apprehensive they are approaching the brood of that reptile.

The Creeper is the smallest of European birds, if we except the crested wren, and weighs only five drachms. The bill is hooked like a sickle. The upper part of the body is variegated with brown and black, and the breast and belly are of a silver white. This bird is very common in England, though, from its extreme agility in eluding the eye of the spectator, it is less frequently seen than other common birds. It feeds upon insects, and builds in the holes of trees.



1. Wryneck. _ 2 Hook-billed Creeper. _ 3. Toucan
4. Rhinoceros Hornbill.

About fifty species foreign and domestic have been enumerated of this bird. The colour of this bird is in general olive green. It inhabits the Sandwich islands, and is one of the birds whose plumage the natives make use of for their feathered garments.

In this order is included a numerous list from all the tropical forests of the east and west; that however which seems next to challenge our attention is the TOUCAN, a bird of the pie kind, whose bill is nearly as large as the rest of its whole body; and the tongue of which is feathered at the edges.

Of this extraordinary bird there are about fifteen species. We shall only describe the red-beaked toucan. It is about the size of, and shaped like a jack-daw, with a large head to support its monstrous bill; this bill, from the angles of the mouth to its point, is six inches and an half; and its breadth, inthe thickest part is a little more than two. Its thickness near the head, is one inch and a quarter; and it is a little rounded along the upper chap, the under side being rounded also; the whole of the bill extremely slight, and a little thicker than parchment. The upper chap is of a bright yellow, except on each side, which is of a fine scarlet colour; as is also the lower chap, except at the base, which is purple. Between the head and the bill there is a black line of separation all round the base of the bill; in the upper part of which the nostrils are placed, and are almost covered with feathers which has occasioned some writers to say, that the toucan has no nostrils. Round the eyes, on each side of the head, is a space of bluish skin, void of feathers; above which the head is black, except a white spot on each side joining to the base of the upper chap. The hinder part of the neck, the back, wings, tail, belly, and thighs, are black. The under side of the head, throat, and the beginning of the breast, are white. Between the white on the breast, and the black on the belly, is a space of red feathers, in the form of a new moon, with its horns upwards. The legs, feet and claws, are of an ash-colour; and the toes stand like those of parrots, two before, and two behind.

It is reported, by travellers, that this bird, though furnished with so formidable a beak, is harmless and gentle, being so easily made tame, as to sit and hatch its young in houses. It feeds chiefly upon pepper, which it devours very greedily, gorging itself in such a manner, that it voids it crude and unconcocted. This, however, is no objection to the na-

tives from using it again; they even prefer it before that pepper which is fresh gathered from the tree; and seem persuaded that the strength and heat of the pepper is qualified by the bird, and that all its noxious qualities are thus exhausted.

This bird is only found in the warm climates of South America, where it is in great request, both for the delicacy of its flesh, which is tender and nourishing; and for the beauty of its plumage, particularly the feathers of the breast. The skin of this part the Indians pluck off, and when dry, glue to their cheeks; and this they consider as an irresistible addition to their beauty. The MOTMOT is a bird almost exactly resembling the toucan, and considered by some as of the same genus.

The HORNBILL. Nearly allied to the Toucan is the Hornbill, by some called the *calao* or *Indian Raven*. It indeed seems to hold the same place in the warm climates of the old continent as the Toucan does in the new. The distinguished characteristic of this genus is an immense bending bill with frequently a large protuberance in the upper part of it resembling an additional bill.

The *Rhineceros Hornbill*, or *Rhinoceros* bird, is nearly as large as a Turkey; the Bill is ten inches long, and two and a half thick at the base. On the upper part is an appendage as large as the bill itself, and turning upwards, which measures eight inches in height. There is nothing else remarkable in the bird, as the general colour of the plumage is black. This bird is found in most parts of the East Indies, where (like the Raven) it feeds upon carrion.

The *Helmet Hornbill* is remarkable for having the same prominence of a conical form; and in the *Philippine* Isles there is a species, the horn of which reaches backwards beyond the eyes, ending in two angular points, which produce the effect of a bird with two horns.

Of the *Pied Hornbill*, or calao of Malabar; the circumstance which distinguishes it from the rest of its kind, is, that the breast, belly, and a part of the wings are white, the remainder of the body is, like the rest of these animals, black.

There are about twelve species of this bird in all, one of which is white.

The PARROT is the best known among us of all foreign birds, as it unites the greatest beauty with the greatest docility.

The ease with which this bird is taught to speak, and the great number of words which it is capable of repeating, are equally surprising. We are assured, by a grave writer, that one of these was thought to repeat a whole sonnet from Petrarch; and "that I may not be wanting in my instance, says a late writer, I have seen a parrot, belonging to a distiller, who had suffered pretty largely in his circumstances from an informer who lived opposite him, very ridiculously employed. This bird was taught to pronounce the ninth commandment, *Thou shalt not bear false witness against thy neighbour*, with a very clear, loud, articulate voice. The bird was generally placed in its cage over against the informer's house, and delighted the whole neighbourhood with its persevering exhortations."

Willoughby tells a story of a parrot, which is not so dull as those usually brought up when this bird's facility of talking happens to be the subject. A parrot belonging to King "Henry the Seventh, who then resided at Westminster, in "his palace by the river Thames, had learned to talk many "words from the passengers as they happened to take water. "One day, sporting on its perch, the poor bird fell into the "water, at the same time crying out, as loud as he could, *A* "*boat, twenty pound for a boat.* A waterman, who happened "to be near, hearing the cry, made to the place where the "parrot was floating, and taking him up, restored him to the "king. As it seems the bird was a favourite, the man in-"sisted that he ought to have a reward rather equal to his "services than his trouble; and, as the parrot had cried "twenty pounds, he said the king was bound in honour to "grant it. The king at last agreed to leave it to the par-"rot's own determination, which the bird hearing, cried out, "*Give the knave a groat.*"

Those who usually bring these birds over are content to make three or four distinctions. The large kind, which are the size of a raven, and are called Maccaws; the next size are simply called Parrots; those which are entirely white are called Lories; and the lesser size of all are called Parakeets. The difference between even these is rather in the size than in any other peculiar conformation, as they are all formed alike, having toes two before and two behind for climbing and holding; strong hooked bills for breaking open nuts, and other hard substances, on which they feed; and loud harsh voices, by which they fill their native woods with clamour.

The bill is fashioned with peculiarities; for the upper chap, as well as the lower, are both moveable. In most other birds the upper chap is connected, and makes but one piece with

the skull; but in these, and in one or two species of the feathered tribe more, the upper chap is connected to the bone of the head by a strong membrane, placed on each side, that lifts and depresses it at pleasure. By this contrivance they can open their bills the wider; which is not a little useful, as the upper chap is so hooked and so over-hanging, that, if the lower chap only had motion, they could scarcely gape sufficiently to take any thing in for their nourishment.

The tongue of this bird somewhat resembles that of a man; for which reason, some pretend that it is so well qualified to imitate the human speech; but the organs by which these sounds are articulated lie farther down in the throat, being performed by the great motion which the os hyoides has in these birds above others.

The parrot, though common enough in Europe, will not, however, breed here. The climate is too cold for its warm constitution; and though it bears our winter when arrived at maturity, yet it always seems sensible of its rigour, and loses both its spirits and appetite during the colder part of the season.

The sagacity, which parrots shew in a domestic state, seems also natural to them in their native residence among the woods. They live together in flocks, and mutually assist each other against other animals, either by their courage or their notes of warning. They generally breed in hollow trees, where they make a round hole, and do not line their nest within. If they find any part of a tree beginning to rot from the breaking off of a branch, or any such accident, this they take care to scoop, and to make the hole sufficiently wide and convenient; but it sometimes happens that they are content with the hole which a wood-pecker has wrought out with greater ease before them; and in this they prepare to hatch and bring up their young.

They lay two or three eggs; and probably the smaller kind may lay more; for it is a rule that universally holds through nature, that the smallest animals are always the most prolific.

It is not for the sake of their conversation alone that the parrot is sought after among the savages; for, though some of them are but tough and ill-tasted, yet there are other sorts, particularly of the small parakeet tribe, that are very delicate food. The food of the cotton-tree intoxicates them in the same manner as wine does man; and even wine itself is drunk by parrots, by which they are thus rendered more talkative and amusing. But of all food, they are fondest of the carthamus, or bastard saffron; which, though strongly purga-



1. Garnet Throated Humming Bird.— 2. Cockatoo.
3. King Bird of Paradise. —4. Magnificent Bird of Par

tive to man agrees perfectly with their constitution, and fattens them in a very short time.

Latham enumerates near a hundred and fifty different species of this bird. The Maccaw is the largest species, some being as large as a capon; the common parrot holds the middle rank, and the Lory and the Parakeets are the smallest, some of them not exceeding the size of a common sparrow. The parrakeet tribe in Brasil are most beautiful in their plumage, and the most talkative birds in nature. They are very tame, and appear fond of mankind; they seem pleased with holding parley with him; and while he continues to talk, answer him, and appear resolved to have the last word. The fowler walks into the woods, where they keep in abundance; but as they are green, and exactly the colour of the leaves among which they sit, he only hears their prattle, without being able to see a single bird; he looks round him, sensible that his game is within gun-shot in abundance, but is mortified to the last degree that it is impossible to see them. Unfortunately for these, however, as soon as they have stripped the tree on which they sate of all its berries, some one of them flies off to another; and, if that be found fit for the purpose, it gives a loud call, which all the rest resort to. That is the opportunity the fowler has long been waiting for, he fires in among the flock while they are yet on the wing: and he seldom fails of bringing down a part of them. But it is singular enough to see them when they find their companions fallen. They set up a loud outcry, as if they were chiding their destroyer, and do not cease till they see him preparing for a second charge.

Of the *Cockatoo*, or crested parrot there are several species, but they chiefly differ in their plumage. The most common is the white or rather cream coloured, some however are black, and some of the white kind have a scarlet crest: This species is called the crowned cockatoo.

The *Horned Parrot* is a bird of singular beauty and elegance. It is about the size of a small dove. The bill is bluish at the base, and black at the tip. The sides of the head are orange. From the crown spring two slender dusky feathers, about an inch and a half long and tipped with crimson. The hind part of the neck and rump are yellow, the rest of the body is green except the ends of the wings and the tail, which are blue. It is an inhabitant of New Caledonia.

Of the Ani there are about three species. Their bill resembles in a great measure that of the parrot. The *greater Ani* is the size of a jay, the *lesser* about the size of a black-

bird. The general colour of their plumage is black. They are gregarious birds, inhabiting the West India islands, and may be made talk like parrots.

The WATTLE BIRD is a native of New Zealand. It is about the size of a jay, of an ash colour, and is peculiarly distinguished by the wattles which grow under the bill like those of a cock. The flesh is eatable.

Of the GRACKLE there are about eleven species inhabiting America and the tropical climates, some of them the size of a magpie, others about that of a blackbird. Their general plumage is black. They live on maize, fruits and insects; but one species in the Philippine islands, which is called from its resemblance to the next genus, and from its beauty, the *Paradise Grackle*, is remarkable for its being an extraordinary destroyer of grasshoppers. The inhabitants of the Isle of Bourbon, being greatly infested with that insect, imported a pair of these birds, which presently relieved them from that pest. In process of time however the grackles became very numerous, and the inhabitants thinking them injurious, proscribed them by an edict, on which the grasshoppers increased so fast upon them, that they were obliged to send for more, which presently dispatched every grasshopper in the island.

The *boat tailed* Grackle from Jamaica, has its plumage black, but it is remarkable for the feathers of its tail forming a hollow like a boat on the upper surface, so that it may be compared to a hen's tail with the underside turned uppermost. It is the size of a cuckow.

The BIRD of PARADISE. This bird has been more celebrated for the false and imaginary qualities which are attributed to it, than for its real, and truly remarkable properties. It has been reported of it, that it is naturally without legs, and is perpetually upon the wing, even while it sleeps, and that it subsists entirely upon vapours and dew, with a variety of other assertions, equally false and equally ridiculous. There are about eight different species of these birds; but that which is best known is the *greater Paradise Bird*, which appears to the eye of the size nearly of a pigeon, though in reality the body is not much larger than that of a thrush. The tail, which is about six inches, is as long as the body; the wings are large compared with the bird's other dimensions. The head, the throat and the neck are of a pale gold colour. The base of the bill is surrounded by black feathers, as also the side of the head and throat, as soft as velvet, and change-

able like those of the neck of a mallard. The hinder part of the head is of a shining green, mixed with gold. The body and wings are chiefly covered with beautiful brown, purple and gold feathers. The uppermost part of the tail feathers are of a pale yellow, and those under them white and longer than the former; for which reason the hinder part of the tail appears to be all white. But what chiefly excites curiosity, are two long naked feathers, which spring from the upper part of the rump above the tail, and which are usually about two feet long. These are bearded only at the beginning and the end; the whole shaft for about one foot nine inches being of a deep black, while the feathered extremity is of a changeable colour, like the mallard's neck.

This bird is a native of the Molucca Islands, but found in greatest numbers in that of Aro. The inhabitants are not insensible of the pleasure they afford, and give them the name of God's birds, as being superior to all that he has made. They live in large flocks, and at night generally perch upon the same tree. They are called by some, the Swallows of Ternate, from their rapid flight, and from their being continually on the wing in pursuit of insects, their usual prey.

As the country where they are bred has its tempestuous season, when rains and thunders continually disturb the atmostphere, these birds are then but seldom seen. The natives, who make a trade of killing and selling these birds to the Europeans, generally conceal themselves in the trees where they resort, and having covered themselves up from sight in a bower made of the branches, they shoot at the birds with reedy arrows; and, as they assert, if they happen to kill the king, they then have a good chance for killing the greatest part of the flock. The chief mark by which they know the king is by the ends of the feathers in his tail, which have eyes like those of a Peacock. When they have taken a number of these birds their usual method is to gut them and cut off their legs;* they then run a hot iron into the body, which dries up the internal moisture; and filling the cavity with salts and spices, they sell them to the Europeans for a perfect trifle.

The *King bird* of *Pardise* is about the size of a lark. The upper parts of the plumage are of a bright red, and the breast is a blood red colour with a broad green bar. The wing feathers are a little mottled with white and green, and

* This has given rise to the ridiculous fable above quoted; and the reason of this operation is that they are used in that country as aigrettes, and for other ornaments of dress; and that being the case, it is usual to cut off the useless and less brilliant parts.

the whole plumage has a fine gloss like satin. The tail is remarkably short, and from it springs two naked feathers like those in the former species, except that they coil in a spiral manner at the end. It is supposed to breed in New Guinea, where there is also a species the predominant colour of which is black.

The *magnificent bird of Paradise* is superior to all the preceding in the beauty of its plumage. It is the size of a blackbird. The crown of the head is a deep chesnut. At the back part of the neck a tuft of yellowish feathers arises, each of which is marked near the tip with a black spot; beneath these springs another tuft still larger and of a straw colour. The back and tail are of a bright red brown. Down the middle of the throat, neck and breast, the colour is blue green, which is encircled by a gorget (as it were) of black with a green shade. The long feathers from the tail are without tufts at the end, but are furnished with very short green webs on one side. Besides these there is the *gorget bird of Paradise*, and some other species of less note.

The BEEF EATER is about eight inches and a half long. The upper part of its plumage is light brown, and its breast a dirty yellow. It has a strong and thick bill, with which it picks the worms and other insects which are enclosed under the skin on the backs of the oxen, whence it derives its name. It is a native of Senegal.

Of the CURUCUI there are about seven species, most of them inhabitants of South America. They are beautiful birds, the plumage of some of them being ash coloured, and of others reddish, finely varied with white, &c. The *Red bellied Curucui* is of a green colour on the back, wings, &c. and the lower parts of a fine red. The whole genus is distinguished by having the nostrils covered with thick bristles. They are mostly of the size of a blackbird.

The BARBETS are described as a dull stupid race of birds, inhabiting the tropical climates. They probably take their name from the strong bristles which surround the bill. They are in general larger than a lark, and vary greatly in plumage, being black, green, reddish, pied, &c.

The JACAMAR is a beautiful bird. The general colour of its plumage is green, and in its habits and form it bears a considerable resemblance to the kingfisher. There are three or four species of this bird, all of them inhabitants of South America.

The TODY is a small bird which bears considerable relation to the fly-catchers. Latham reckons about fourteen species, all inhabiting the warmer climate of America. They are green, ash coloured, blue, brown and pied, and seldom are found to exceed the size of a wren.

THE HUMMING-BIRD. Of this charming little animal, there are not less than sixty species, from the size of a small wren, down to that of a bee. An European could never have supposed a bird existing so very small, and yet completely furnished with a bill, feathers, wings, and intestines, exactly resembling those of the largest kind. A bird not so big as the end of one's little finger, would probably be supposed but a creature of imagination, were it not seen in infinite numbers, and as frequent as butter-flies in a summer's day, sporting in the fields of America, from flower to flower, and extracting their sweets with its little bill.

The smallest humming-bird is about the size of a bee, and weighs no more than twenty grains. The feathers on its wings and tail are violet brown, but those on its body, and under its wings, are of a greenish brown; with a fine red cast or gloss, which no silk or velvet can imitate. The bill is black, straight, slender, and of the length of three lines and a half. The *Ruby-crested Humming-bird* is larger than the preceding. Its throat is like burnished gold glossed with emeralds; and it has a small crest on its head, green at the bottom, and as it were gilded at the top; and which sparkles in the sun like a little star in the middle of its forehead.

The *Garnet-throated Humming-bird*, is four inches and a quarter long. It has a hooked bill about an inch long, the head neck, back, &c. dark green, and the throat a fine garnet appearing glossy in some directions. The *gold-throated Humming-bird* is about half as big as the common wren, and without a crest on its head; but to make amends, it is covered, from the throat half way down the belly, with changeable crimson-coloured feathers, which in different lights, change to a variety of beautiful colours, much like an opal. The *Ruby-necked* is however the most beautiful of all species. It is about the size of the preceding. The upper parts of the body are brown with a mixture of green gold, and the throat like the finest topaz. There are, in a word, of almost all colours of these beautiful animals, crimson, green, emerald, white breasted, and spotted. Some of them with, and some without crests. The eyes of most of them are very small and as black as jet.

It is inconceivable how much these add to the high finishing and beauty of a rich luxurious western landscape. As soon as the sun is risen, the humming-birds, of different kinds, are seen fluttering about the flowers, without even lighting upon them. Their wings are in such rapid motion, that it is impossible to discern their colours, except by their glittering. They are never still, but continually in motion, visiting flower after flower, and extracting its honey. For this purpose they are furnished with a forked tongue, that enters the cup of the flower, and extracts its nectared tribute. Upon this alone they subsist. The rapid motion of their wings brings out an humming sound, whence they have their name.

The nests of these birds are not less curious than the rest: they are suspended in the air, at the point of the twigs of an orange, a pomegranate, or a citron tree; sometimes even in houses, if they find a small and convenient twig for the purpose. The female is the architect, while the male goes in quest of materials; such as cotton, fine moss, and the fibres of vegetables. The nest is about the size of an hen's egg cut in two. They lay two eggs at a time, and never more, about the size of small peas, and as white as snow, with here and there a yellow speck. The time of incubation continues twelve days; at the end of which the young ones appear, and are much about the size of a blue-bottle-fly.

It is a doubt whether or not these birds have a continued note in singing. All travellers agree that, beside the humming noise produced by their wings, they have a little interrupted chirrup; but Labat asserts, that they have a most pleasing melancholy melody in their voices, though small and proportioned to the organs which produce it. It is very probable that, in different places, their notes are also different; and as there are some that continue torpid all the winter, there may likewise be some with agreeable voices, though the rest may in general be silent.

CHAP. XXVI.

Of Birds of the Passerine, or Sparrow Order—The STARE—*The* THRUSH—*The Missel Thrush—The Throstle—The Red wing—The Fieldfare—The Blackbird—The King Ouzle—The Water Ouzle—The Rose-coloured Ouzle—The Blue and Solitary Thrushes—The Mock-bird—The White-tailed Thrush—The* CHATTERER—*The Bohemian and Caruncculated Chatterer—The* GROSBEAK—*The Hawfinch—The Pine Goasbeak—The Cross-bill—The Bullfinch—The Yellowhammer—The Reed Sparrow—The Tawny Bunting—The Ortolan—The Black-throated Bunting—The* FINCHES—*The Sparrow—The Goldfinch—The Linnet—The Twite—The* FLYCATCHER—*The Fan-tailed Fly-catcher—The* LARK *Genus—The* WAGTAIL—*The White, Yellow, and Grey Wagtail—The* WARBLERS—*The Nightingale—The Redbreast—The Redstart—The Black-cap—The Wren—The Canary Bird—The Hedge Sparrow—The Wheat-eater—The Whinchat—The Stone-chatter—The White-throat—The Thorn-tailed Warbler—The* TITMOUSE—*The Swallow—The Swift—The Martin—The* GOATSUCKER—*The* COLY—*The* TANAGER—*The* MANAKIN.

The Passerine, or Sparrow Order.

THE STARE OR STARLING.

THERE are few birds better known in these temperate climates than that under our consideration. It has a nearer relation with the blackbird than with any other; but it is distinguished from that genus by the glossy green of its feathers, in some lights, and the purple in others. It breeds in hollow trees, the eaves of houses, towers, ruins, cliffs, and often in high rocks over the sea. It lays four or five eggs of a pale greenish ash-colour, and makes its nest of straw, small fibres of roots, &c. Its voice is rough; but what it wants in the melody of note, it compensates by the facility with which it is taught to speak. In winter these birds assemble in vast flocks, and feed upon worms and insects. At the approach of spring they assemble in fields, as if in consultation together, and for three or four days seem to take no nourishment: the greater part leave the country; the rest breed here, and bring up their young.

Of the stare there are about thirteen species of foreign and domestic. There have been found varieties of the *common stare*, white, black, and pied. At New Zealand is a species distinguished by wattles, like those of a cock: at the Cape of

Good Hope they are found with combs; and in China there is a species of a beautiful green.

Of the THRUSH there are no less than one hundred and thirty species, foreign and domestic.

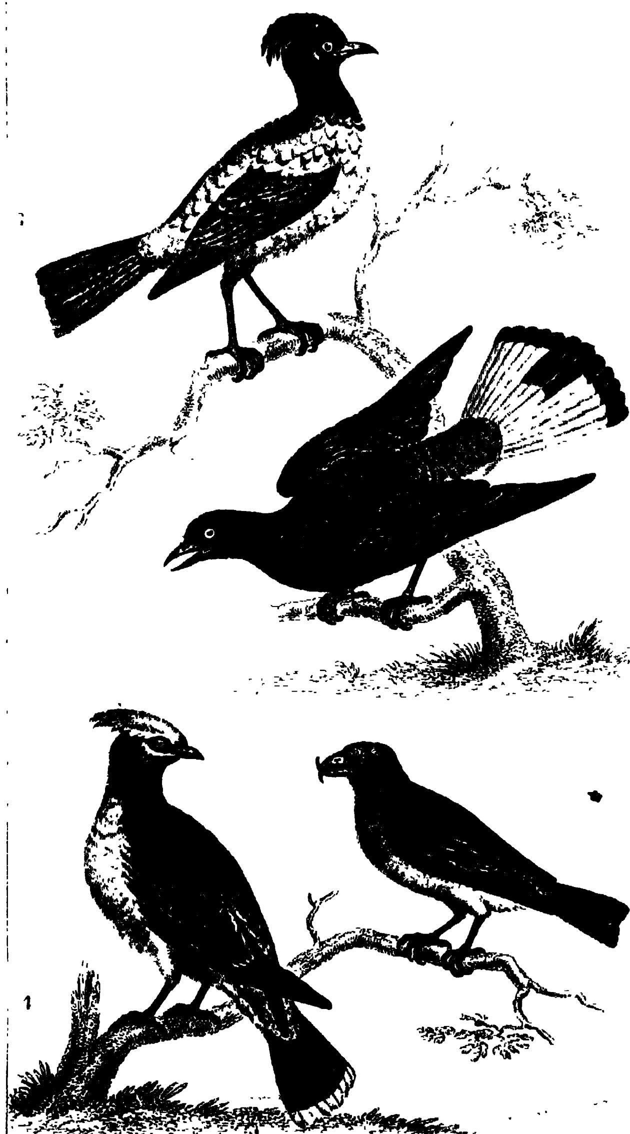
The *Missel-thrush* is distinguished from all of the kind by its superior size, being much larger than any of them, viz. eleven inches in length, and weighing near five ounces. It differs scarcely in any other respect from the throstle, except that the spots on the breast are larger. It builds its nest in bushes, or on the side of some tree, as all of this kind are found to do, and lays four or five eggs in a season. Its song, which it begins in spring, sitting on the summit of a high tree, is, not, however, so fine, as that of the throstle. It is the largest bird of all the feathered tribe that has music in its voice; the note of all greater birds being either screaming, chattering, or croaking. It feeds on insects, holly and misletoe-berries; and sometimes sends forth a very disagreeable scream when frightened or disturbed. It is very common in England.

The *Throstle* is only nine inches in length. It differs from the missel-thrush chiefly in the marks on its breast, which in the former are of an irregular shape; but in the throstle are like heads of arrows with the points upwards. Varieties of this bird have been found wholly white.

The *Red-wing* is easily distinguished from the two former species by having a white streak over the eye, and the under parts of the wings reddish. The *field-fare* is known by his yellowish bill, by the dark colour of his legs, and by his head being ash-colour spotted with black. The field-fare and red-wing make but a short stay in this country. With us they are insipid, tuneless birds, flying in flocks, and excessively watchful to preserve the general safety. All their season of music and pleasure is employed in the more northern climates, where they sing most delightfully perched among the forests of maples, with which those countries abound. They build their nests in hedges; and lay six bluish green eggs spotted with black.

The *Black-bird* or *Ouzel* is about the size of ten inches. The female is generally brown; and varieties are found of them both white and pied, particularly in cold countries. It plasters its nest, which is commonly in the stump of a hawthorn, in the inside with clay, and lays about four or five bluish eggs.

The *Ring Ouzel* in size rather exceeds the black-bird. It appears of a dull black, and on the breast is a patch of white



1, Rose Colored Ouzel, - 2, White Tailed Thrush,
3, Cross bill, - 4, Bohemian Chatterer?

passing a little backwards like a collar. They generally build near streams, and are birds of passage in all the southern parts of Europe.

Nearly allied to this last is the *Water Ouzel.* It is rather less than a black-bird. The upper parts of the body have more of a brownish cast than in the former bird. It does not go in flocks like the ring ouzel, but lives chiefly in the neighbourhood of streams, and particularly such as take their course among rocks. It dives after small fishes, and even runs after them at the bottom of the stream as on land.

The *Rose-coloured Ouzel,* is the size of the starling. The feathers of its head are long, and form a crest. The upper parts of the body are black, with glosses of blue, purple, and green; the lower parts of the body are of a pale rose-colour. This bird is common in many parts of Europe and Asia, but is very scarce in England.

The *Blue* and *Solitary Thrushes* form two species nearly resembling in habits and in manners. Their plumage is in general blue, though the latter has a cast of brown. It is not uncommon in France and Italy, where it chuses the most frightful precipices for its residence, whence it probably receives its name. As it is rarely caught, it is in high estimation even in the countries where it breeds, but still more valuable when carried from home. It not only whistles in the most delightful manner, but speaks with an articulate distinct voice. It is so docile, and observes all things with such diligence, that, though waked at midnight by any of the family, it will speak and whistle at the word of command.

To this tribe might be added an immense list of foreign birds of the thrush kind, and living like them upon fruit and berries. Words could not afford variety enough to describe all the beautiful tints that adorn some of them. The brilliant green of the emerald, the flaming red of the ruby, the purple of the amethyst, or the bright blue of the sapphire, could not by the most artful combination shew any thing so truly lively or delightful to the sight as the feathers of the chilcoqui or the tautotol. Passing, therefore, over these beautiful, but little known, birds, we shall only mention the American *Mimic-thrush,* or *Mock-bird.* It is but a plain bird to the eye, about the size of a thrush, of a uniform grey colour, and a reddish bill. It is possessed not only of its own natural notes, which are musical and solemn, but it can assume the tone of every other animal in the wood, from the wolf to the raven. It seems even to sport itself in leading them astray. It will at one time allure the lesser birds with the call of their males, and then terrify them, when they have come near, with the

screams of the eagle. The mock-bird, however, pleases most when it is most itself. At those times it usually frequents the houses of the American planters; and, sitting all night on the chimney-top, pours forth the sweetest and the most various notes of any bird whatever. It would seem, if accounts be true, that the deficiency of most other song-birds in that country is made up by this bird alone. They often build their nests in the fruit-trees about houses, and are easily rendered domestic.

The CHATTERERS form a very beautiful race of birds, including about ten species. That which is called the *Waxen*, or *Bohemian Chatterer*, is the size of a large lark, eight inches. Its head is adorned with a beautiful pointed crest. The upper parts of the body are of a reddish ash-colour; the breast and belly of a pale, purplish chesnut; a black streak passes over each eye; the chin also and quills are black. Their native country is Bohemia, whence they wander in flocks all over Europe, and were formerly superstitiously considered as a passage of a pestilence. They are seldom seen in the south parts of Britain.

The *Carunculated Chatterer* is a native of Cayenne and Brasil. It is about twelve inches long. The plumage of the male is of a pure white, except a tinge of yellow on the rump, quills, and tail. The female has the upper parts of the plumage olive-grey, and the lower parts grey, edged with olive. Both have a fleshy carbuncle at the base of the bill, which projects over it like that of a turkey-cock. Their voice is (like that of all the kind) noisy and garrulous, and so loud, that it may be heard at the distance of half a league.

The GROSBEAKS form a very extensive genus of birds, including nearly 100 species, of which, however, not more than five are common in Europe, viz. the hawfinch, the pine grosbeak, the crossbill, the bullfinch, and the green grosbeak, or greenfinch. Their common character is a short, thick bill, and a tongue as if cut off at the end.

The first of these, the *Hawfinch*, visits England at uncertain times. It is in length six inches and three quarters. The chin is black; the neck ash colour, the body brown, with the greater quill-feathers black, and the under-parts of the body of a dirty flesh-colour.

The *Pine Grosbeak* is quite the size of the bullfinch. The head, neck, breast, and rump are crimson; the back and wing-coverts black. It frequents the pine-forests in all the northern parts of Europe.

The *Cross-bill* is too curious a bird to be overlooked. It is common in all the northern kingdoms of Europe, and sometimes visits England. Besides the singularity of its bill, it is remarked for varying its colours. The males, which are red, alter sometimes to orange; the females, which are green, to different shades of the same colour. It is about the size of a lark, and feeds on the cones of pines, and pippings of fruit. They are said to divide an apple with one stroke of the bill to get at the contents.

The *Bullfinch* is too well known to need a description. It is chiefly remarkable for its capability of being taught to sing and whistle different tunes. Some varieties have been found black, and some perfectly white.

The *Greenfinch* is also well known, being about the size and shape of the bullfinch, and of a yellowish green. This bird is so easily tamed, that it will eat out of the hand five minutes after it is taken. To produce this effect, no more is necessary than to take it into the dark and put it on your finger, to which the bird will cautiously adhere; as it does not know whither to fly, you may then introduce the finger of the other hand under its breast, upon which it will climb, and, not finding any disposition to hurt it, will presently become tame and familiar.

Among the foreign birds of this genus is that beautiful little animal, so well known for its red bill and elegant plumage, which generally goes under the name of the *Java Sparrow*. The *spotted Grosbeak* is a native of New England.

The BUNTING genus are distinguished by a strong conic bill, and in the roof of the upper mandible a hard knob to break and grind seeds.

The first of this species which we shall mention, is a bird well known by the name of the *yellow-hammer*, and distinguished by the crown of the head being generally of a beautiful pale yellow. It is a bird little esteemed, as its voice is monotonous, and possesses but little melody.

The *Common Bunting* is the size of the former, but stouter in the body. It is of a pale olive-brown. They collect in flocks in the winter, and are often seen on the branch of some bare tree in immense numbers. They are caught and sold, from the similarity of their plumage, for larks, and are called bunting-larks.

The *Reed Sparrow* inhabits marshy places. In the male the head, chin and throat are black, with a white ring round its neck. The upper parts of the body are brownish red, with a

streak of black, the lower parts white. In Lorrain, and some parts of Europe, they are birds of passage.

The *Tawny Bunting* is six inches 3-4ths long. The head and neck are tawny, the back black, the lower parts of the body are white, and the tail a little forked. It is not a common bird in England. The *Snow Bunting* has the forehead and crown white, with some mixture of black; the back, and middle feathers of the tail black; the rump, the outer feathers of the wings and tail white. They are called in Scotland *Snow-flakes*, from their appearance in snowny weather: the more northward they are found, the whiter the plumage. The *mountain-finch* is less common. The plumage in general, on the upper parts, is ash-colour spotted with black; and the breast is waved with flame-colour.

But the most famous bird of all this genus is the *Ortolan*. It is somewhat less than the yellow-hammer. The plumage on the upper parts is brownish chesnut, mixed with black, the under parts are pale rufous. These birds are common in France and Italy, but are not found in England. They are caught in numbers to fatten for the table. This is done by including them in a dark room, and feeding them with oats and millet. By this process they become so fat, that they would die from that cause alone, were they not killed for sale. In this state they will sometimes weigh three ounces, and are accounted the most luxurious repast of the epicure, being, as it were, one lump of exquisite fat.

The *Black-throated Bunting* is a native of America. It is in general brown, with a yellow breast, and a black spot under the throat. There are about sixty-five species of the bunting, foreign and domestic.

The FINCH genus is distinguished from the preceding by a bill perfectly conic. It includes more than one hundred species, one of which, the *Sparrow*, has given a name to this order of birds. Of the sparrow there are two species, the *Tree* and the *House-sparrow*, the latter of which is the larger: they are both well-known birds.

The *Goldfinch* is the most beautiful bird which inhabits these regions, and is also one of the most docile and harmonious. The *Chaffinch* resembles the bullfinch, but it is not so black on the head, nor so deep a red on the breast, and is conspicuous for a broad bar of white on each wing; its song is agreeable in spring, but in summer it only chirps. The *Siskin*, or *Aberdavine*, is a much less common bird, being in fact only a bird of passage in England. The bill is white, the

top of the head black, the upper parts of the body yellowish olive, and the under parts greyish yellow. It is a song-bird, but of inferior note.

The *Linnet* is too well known to require a description.

Of the *Red-pole*, or *Red-headed Linnet* there are two species, the greater and the less, but both are less than the common linnet. They are both distinguished by a blood-coloured spot on the head, and by the breast being tinged with the same colour; the breast of the females is, however, yellow, whence it is a common fraud in the shops to paint their breasts red, in order to pass them off for males. The *Mountain Linnet*, or twit, includes also two varieties, the one the size of the common linnet, the other much smaller. The colour of the plumage is in general brownish-red, like the common linnets, but the rump is crimson, scarlet, or orange. They are common in England, and are easily tamed; but there is no harmony in their note.

This genus comprehends a great variety of foreign birds, eminent for their beautiful plumage, and some for the music of their song: among these, the best known to Europeans, is the *Canary-bird*, which, indeed, is now become so common, and has continued so long in a domestic state, that its native habits, as well as its native country, seem almost forgotten. Though, by the name it appears that these birds came originally from the Canary Islands, yet we have them only from Germany, where they are bred up in great numbers, and sold into different parts of Europe.

In its native islands, a region equally noted for the beauty of its landscapes and the harmony of its groves, the canary-bird is of a dusky grey colour, and so different from those usually seen in Europe, that some have even doubted whether it be of the same species. With us, they have that variety of colouring usual in all domestic fowls; some white, some mottled, some beautifully shaded with green; but they are more esteemed for their note than their beauty, having a high, piercing pipe, as indeed all those of the finch tribe have, continuing for some time in one breath without intermission, then raising it higher and higher by degrees, with great variety.

THE FLYCATCHERS are with us summer birds only, and take their name from feeding upon insects. The *Spotted Flycatcher*, however, eats fruit, and is, on that account, called in Kent, the *cherry-sucker*. It is, in general, of a mouse-colour, the head spotted with black, and the wings and tail edged with white. The *pied flycatcher* is less than a hedge-sparrow, and is known by a white spot on the forehead.

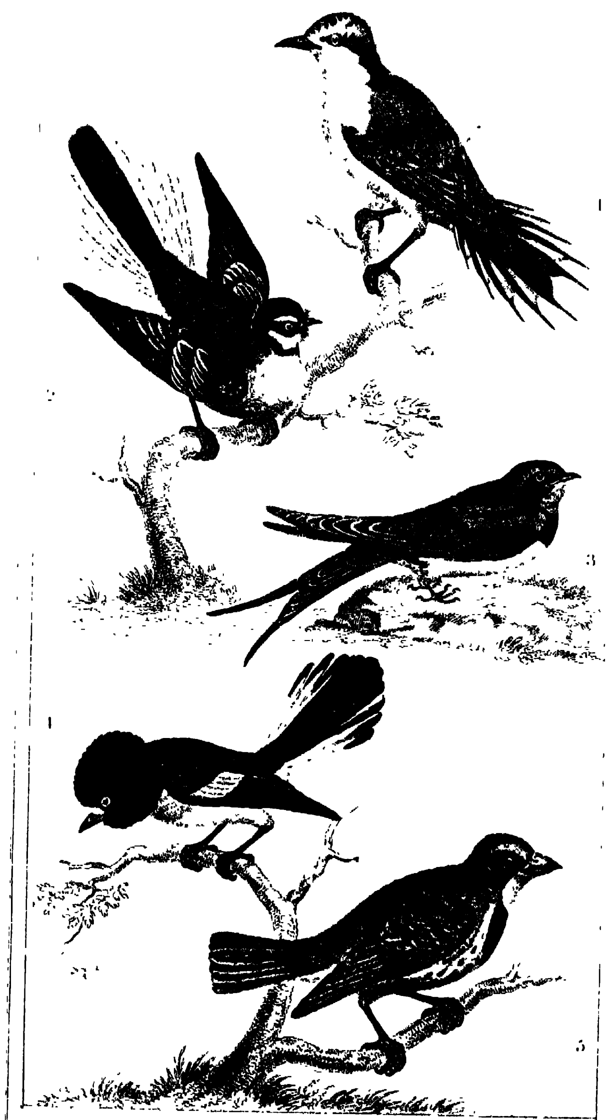
There are upwards of eighty foreign birds of this kind.

The *fan-tailed flycatcher*, is a native of New Zealand. It is about the size of the bearded-titmouse, may be easily tamed, and will sit on any person's shoulder to pick off the flies. The whole head is black, with a white collar; the upper parts of the body olive brown; the under parts yellowish nut-colour, and the tail white, except the two middle-feathers, which are black.

THE LARK genus includes about twenty-eight species, all of them distinguished by the length of their heel. The *Great-crested Lark*, the *Calandre Lark*, the *White-winged Lark*, the *Black Lark*, and some others, are found in different parts of Europe, but do not visit Britain. The *Sky Lark*, which is the most common, the *Wood Lark*, the *Tit Lark*, the *Field Lark*, which is larger than the former, but less than the sky lark; the *Red Lark*, and the *small crested Lark*, which is, however, very uncommon, are all British birds. They are all song-birds; but their music in confinement is much inferior to what it is when possessed of their native liberty. The music, indeed, of every bird in captivity produces no very pleasing sensations; it is but the mirth of a little animal insensible of its unfortunate situation; it is the landscape, the grove, the golden break of day, the contest upon the hawthorn, the fluttering from branch to branch, the soaring in the air, and the answering of its young, that gives the bird's song its true relish. These united, improve each other, and raise the mind to a state of the highest, yet most harmless exultation.

The lark builds its nest upon the ground, beneath some turf that serves to hide and shelter it. The female lays four or five eggs, of a dusky hue, in colour somewhat like those of a plover. It is while she is sitting that the male usually entertains her with his singing; and while he is risen to an imperceptible height, yet he still has his loved partner in his eye, nor once loses sight of the nest either while he ascends or is descending. This harmony continues several months, beginning early in the spring on pairing. In winter, they assemble in flocks, when their song forsakes them, and the bird-catchers destroy them in great numbers for the tables of the luxurious.

Of the WAGTAIL there is about eleven species, with us only the *white*, (so called from having a greater proportion of white on the belly and tail than the others) the *yellow*, and *grey wagtail*, are common. The manners of these birds are well known.



1. Thorn-tailed Warbler. 2. Fan-tailed Flycatcher. 3. Chimney Swallow. 4. Great-headed Titmouse. 5. Black throated Bunting

THE WARBLERS are a very numerous genus, including upwards of one hundred and fifty species, most of them (as the name may serve to intimate) distinguished for the excellence of their music. Of these, the first rank is certainly due to

The Nightingale. This most famous of the feathered tribe visits England in the beginning of April, and leaves it in August. It is found but in some of the southern parts of that country, being totally unknown in Scotland, Ireland, or North Wales. They frequent thick hedges and low coppices, and generally keep in the middle of the bush, so that they are rarely seen. They begin their song in the evening, and generally continue for the whole night. For weeks together, if undisturbed, they sit upon the same tree; and Shakespear rightly describes the nightingale sitting nightly in the same place.

In the beginning of May, the nightingale prepares to make its nest, which is formed of the leaves of trees, straw, and moss. The nest being very eagerly sought after, is as cunningly secreted; so that but very few of them are found by the boys when they go upon these pursuits. It is built at the bottom of hedges, where the bushes are thickest and best covered. While the female continues sitting, the male, at a good distance, but always within hearing, cheers the patient hour with his voice, and, by the short interruption of his song, often gives her warning of approaching danger. She lays four or five eggs; of which but a part, in our cold climate, come to maturity.

The delicacy, or rather the fame, of this bird's music, has induced many to abridge its liberty to secure its harmony. Its song, however, in captivity is not so very alluring; and the tyranny of taking it from those hedges where only it is most pleasing, still more depreciates its imprisoned efforts. Gesner assures us, that it is not only the most agreeable songster in a cage, but that it is possessed of a most admirable faculty of talking. He tells the following story in proof of his assertion, which he says was communicated to him by a friend. "Whilst I was at Ratisbone," says his correspondent, "I put up at an inn, the sign of the Golden Crown, "where my host had three nightingales. It happened at that "time, being the spring of the year, when those birds are "accustomed to sing, that I was so afflicted with the stone, "that I could sleep but very little all night. It was usual then "about midnight, to hear the two nightingales jangling, and "talking with each other, and plainly imitating men's dis-"courses. Besides repeating the daily discourse of the

"guests, they chaunted out two stories. One of their stories "was concerning the tapster and his wife, who refused to "follow him to the wars as he desired her; for the husband "endeavoured to persuade his wife, as far as I understood by "the birds, that he would leave his service in that inn, and go "to the wars in hopes of plunder. But she refused to follow "him, resolving to stay either at Ratisbone, or go to Nuremberg. There was a long and earnest contention between "them; and all this dialogue the birds repeated. They even "repeated the unseemly words which were cast out between "them, and which ought rather to have been suppressed and "kept a secret. The other story was concerning the war which "the emperor was then threatening against the Protestants; "which the birds probably heard from some of the generals that had conferences in the house. These things did "they repeat in the night after twelve o'clock, when there "was a deep silence. But in the day time, for the most part, "they were silent, and seemed to do nothing but meditate "and revolve with themselves upon what the guests conferred "together as they sat at table, or in their walks."

Such is the sagacity ascribed to the nightingale. But there is a little bird, rather celebrated for its affection to mankind than its singing, which, however, in our climate, has the sweetest note of all others. The reader already perceives that we mean the *red-breast*, the well-known friend of man, that is found in every hedge, and makes it vocal. The note of other birds is louder, and their inflections more capricious; but this bird's voice is soft, tender, and well supported; and the more to be valued as we enjoy it the greatest part of the winter. If the nightingale's song has been compared to the fiddle, the red-breast's voice has all the delicacy of the flute.

The *Red-start* is a bird of passage, like the nightingale. Its forehead is white; the cheeks and throat black; the neck and back of a bluish grey; and the breast, &c. are red. It has a pleasing note, but will not endure confinement.

The *Black-cap* and the *wren*, though so very diminutive, are yet prized by some for their singing. The former is called by some the mock nightingale; and the latter is admired for the loudness of its note compared to the little body whence it issues.

The *Hedge-Sparrow* is a well-known bird, which has a sweet and plaintive note, which it begins with the first frosty mornings, and continues for some time in the spring. The *Wheat-ear* is more celebrated for the delicacy of its flesh, than for the excellence of its melody. The numbers ensnared in the neighbourhood of Eastbourn, are said to amount annually

about 1840 dozen. The *Whin-chat*, the *Stone-chatter*, and the *White-throat*, are all common birds of this genus: but it would be an endless task to range with the minuteness of a nomenclator through all the varieties. Of the foreign birds the *Thorn-tailed Warbler* is one of the most remarkable. It is a native of Terra del Fuego, is about the size of a sparrow. The upper parts of the body are reddish-brown, mottled with yellow, and the breast and belly are white.

Of the TITMOUSE there are about six species known in these climates, though there are not less than twenty-eight in all. The *great*, the *blue*, the *cole*, the *marsh*, the *long-tailed*, and the *bearded Titmouse*, are all British birds. This last, which is about six inches long, is distinguished by a tuft of black feathers under each eye, resembling a mustacho. It is common in the marshes near London, and has erroneously been classed among the butcher birds.

Many of the foreign birds of this genus are curious. The *great headed titmouse* is a native of New Zealand. It is four inches and a half long. All the upper parts of the body are black, except a spot of white on the head, wings and tail; the breast is orange.

THE SWALLOW kind comprehends about thirty-seven species. The *chimney swallow*, is the most common. The upper parts of its plumage are black, with a purplish gloss; the forehead and chin red; and the breast and belly are white: the tail is very forked.

The *swift* is the largest of the kind known in these climates, being near eight inches long, and the extent of its wings eighteen inches, though it scarcely weighs an ounce. The whole plumage is a sooty black, except the chin, which is white. The legs are remarkably short, and consequently almost all its actions are performed on the wing. All its food is collected in this manner, consisting entirely of insects; and even the materials of its nest it collects either as they are carried about with the wind, or picks up from the surface in its sweeping flight.

The *martin* is inferior in size to the *chimney swallow*, and its tail less forked. The head and upper parts of the body are of a glossy blue black; the breast and belly are white, as is also the rump, which may be considered as its distinctive character. It builds commonly under the eaves of houses, and sometimes against the sides of high cliffs over the sea.

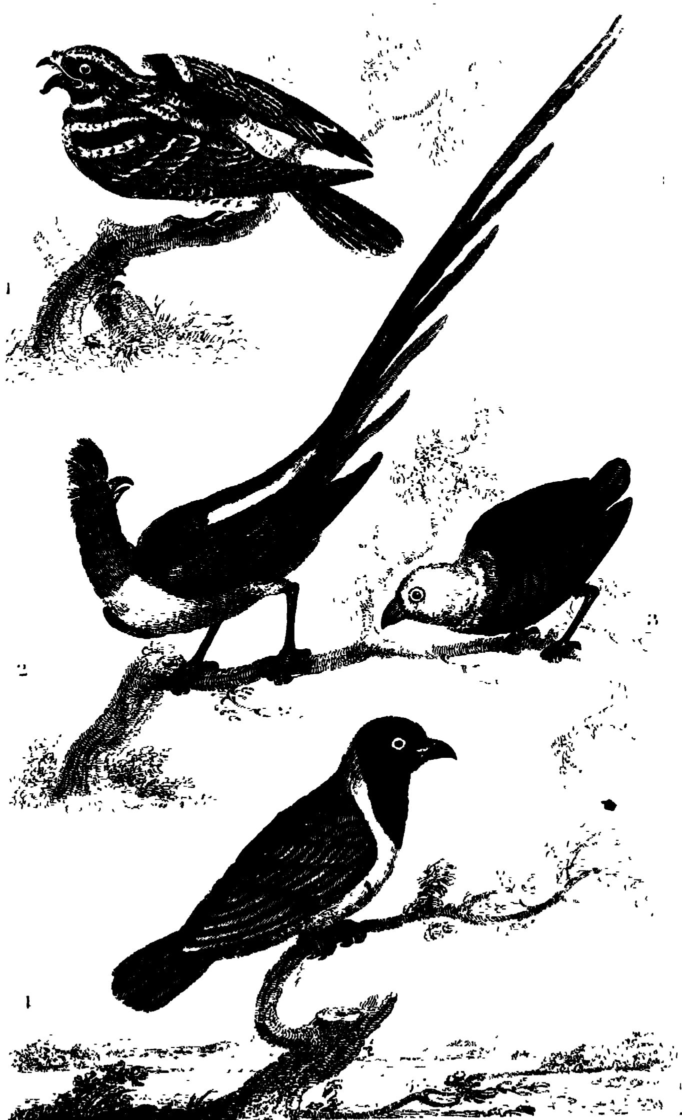
The *sand martin* is the least of the swallow kind that visits Great Britain. The upper parts of the body are mouse coloured; the breast and belly are white, with a mouse-co-

loured ring as a collar. To form its nest it bores some feet deep into a high sand bank, where it deposits five or six white eggs. It has been said that the young of this bird are very fat, and in flavour scarcely inferior to the Ortolan.

These birds are all known by their very large mouths, which when they fly are always kept open: they are not less remarkable for their short slender feet, which scarcely are able to support the weight of their bodies; their wings are of immoderate extent for their bulk; and their note is a slight twittering, which they seldom exert upon the the wing.

This peculiar conformation seems attended with a similar peculiarity of manners. Their food is insects, which they always pursue flying. For this reason, during fine weather, when the insects are most likely to be abroad, the swallows are for ever upon the wing, and seen pursuing their prey with amazing swiftness and agility. All smaller animals, in some measure, find safety by winding and turning, when they endeavour to avoid the greater: the lark thus evades the pursuit of the hawk; and man the crocodile. In this manner, insects upon the wing endeavour to avoid the swallow; but this bird is admirably fitted by nature to pursue them through their shortest turnings. Besides a great length of wing, it is also provided with a long tail, which, like a rudder, turns it in its most rapid motions; and thus, while it is possessed of the greatest swiftness, it is also possessed of the most extreme agility.

The nest of these birds is built with great industry and art; it is formed of mud from some neighbouring brook, well tempered with the bill, moistened with water for the better adhesion, and still farther kept firm, by long grass and fibres: within it is lined with goose feathers, which are ever the warmest and the neatest. The martin covers its nest at top, and has a door to enter at; the swallow leaves her's quite open. But our European nests are nothing to be compared with those the *esculent swallow* builds on the coasts of China and Coromandel; the description of which we give, in the plain honest phrase of Willoughby. "On the sea-coast of "the kingdom of China," says he, "a sort of party-coloured "birds, of the shape of swallows, gather a certain clammy, "glutinous matter, perchance the spawn of whales and other "young fishes, of which they build their nests, wherein they lay "their eggs and hatch their young. These nests the Chinese "pluck from the rocks, and bring them in great numbers "into the East-Indies to sell. They are esteemed, by glut-"tons, as great delicacies; who dissolving them in chicken, "or mutton-broth, are very fond of them; far before oysters, "mushrooms, or other dainty and lickorish morsels."



1. Goatsucker, — 2. White-backed Coly. — 3. Gold headed Manakin. 4. Tanager.

At the latter end of September the swallows leave us; and for a few days previous to their departure, assemble, in vast flocks, on house-tops, as if deliberating on the fatiguing journey that lies before them. This is no slight undertaking, as their flight is directed to Congo, Senegal, and along the whole Morocco shore. There are some, however, left behind in this general expedition, that do not depart till eight or ten days after the rest. These are chiefly the latter weakly broods, which are not yet in a condition to set out.

Those that migrate are first observed to arrive in Africa about the beginning of October. They are thought to have performed their fatiguing journey in the space of seven days. They are sometimes seen, when interrupted by contrary winds, wavering in their course far off at sea, and lighting upon whatever ships they find in their passage. They then seem spent with famine and fatigue, yet still they boldly venture, when refreshed by a few hours rest, to renew their flight and continue the course which they had been steering before.

THE GOATSUCKER is nearly allied to the swallow, both in form and manners. Like the swallow, it is remarkable for the wideness of its gape; like it, it feeds upon insects; like it, collects its food upon the wing; indeed by some authors it has been termed the nocturnal swallow, for it preys entirely in the night, or rather in the dusk of the evening, when the other swallows are retired to rest.

There is only one species known in Europe, and this is considerably larger than the swallow, being 10½ inches in length, and in weight two ounces and an half. The ground of the plumage is almost black, but it is beautifully diversified with ash-colour and white in different parts; and it has, like all the kind, a number of bristles about the bill. It is a great destroyer of cock-chaffers and beetles; and its note resembles the noise of a spinning-wheel. From its nocturnal habits it has been called the night-hawk, and the chum-owl. It visits England about May, and returns in August. There appears to be no other ground for the ridiculous story of sucking the goats, but the width of its mouth, which is to be accounted for on much more rational principles. It makes no nest, but lays its eggs on the bare ground, or some loose crag, without any seeming care whatever.

There are about fifteen foreign species of this bird, one of which is called the *Grand Goatsucker*, and is the size of a small buzzard: it inhabits Cayenne.

There are a few foreign birds belonging to this order, which are not reducible to any of the preceding genera, and which,

therefore, agreeably to our former practice, we introduce at the conclusion of the European birds.

THE COLY genus includes about five species of foreign birds, much resembling each other in character and manners. As a specimen we have selected the *White-backed Coly*, which is an inhabitant of the Cape of Good Hope. It is in length twelve inches. The general colour of the plumage is bluish ash-colour; the head is very full crested; the under parts of the body are whitish, and a stripe of pure white runs the whole way down the middle of the back. The tail is uniform, and of an immense length.

THE TANAGER has been called the red-breasted black-bird, and the greater bulfinch. The genus includes about forty-five species. They are in general about the size of the canary bird, and vary in plumage according to the species and the climate. They bear much relation to the bulfinch, and are found in all the warm climates of America, north and south.

As the last species bears a resemblance to the bulfinch, so the MANAKINS may be said to bear some relation to the tit-mouse. They vary, however, from the size of a pigeon, to that of a small wren. The *Rock*, or *Crested Manakin*, is about ten inches long. The general colour of the plumage is orange, and the head is covered with a beautiful double crest. This species inhabits Surinam, Cayenne, &c. It makes its nest of a few dry sticks. They are in general shy; but are sometimes rendered so tame, that they run along with the poultry.

The *Gold-headed Manakin* is in the other extreme, being only three inches and a quarter long; but it is a most beautiful animal. The head and neck are of a fine golden orange, and the rest of the body, wings and tail, are of a purplish black.

CHAP. XXVII.

Of water-fowl with cloven feet—The SPOON-BILL.—*The* HERON —*The Bittern—The Crane—The Egret—The Stork—The Balearic Crane—The Gigantic Crane—The Demoiselle, or Buffoon Bird—The* IBIS—*The Bay and Egyptian Ibis—The* CURLEW—*The* SNIPE—*The Woodcock—The Godwit—The Greenshank—The Redshank—The Jack Snipe—The Sandpiper—The Lapwing—The Ruff—The Knot—The Purre—The Turnstone—The Dunlin—The* PLOVER—*The Golden and Long-legged Plovers—The Dotterel—The Sanderling—The Ringed Plover—The* OYSTER CATCHER—*The* PRATINCOLE—*The* RAIL—*The* GALLINULE—*The Crake—The Water Hen—The Spotted and Purple Gallinule—The* JABIRU—*The* SCREAMER —*The* BOATBILL—*The* UMBRE—*The* JACANA—*The* SHEATH-BILL—*Water-fowl with pinnated Feet—The* PHALAROPE—*Grey and Red Phalarope—The* COOTE—*The* GREBE—*The crested, eared and red-necked Grebe.*

Cloven-footed Water-Fowl.

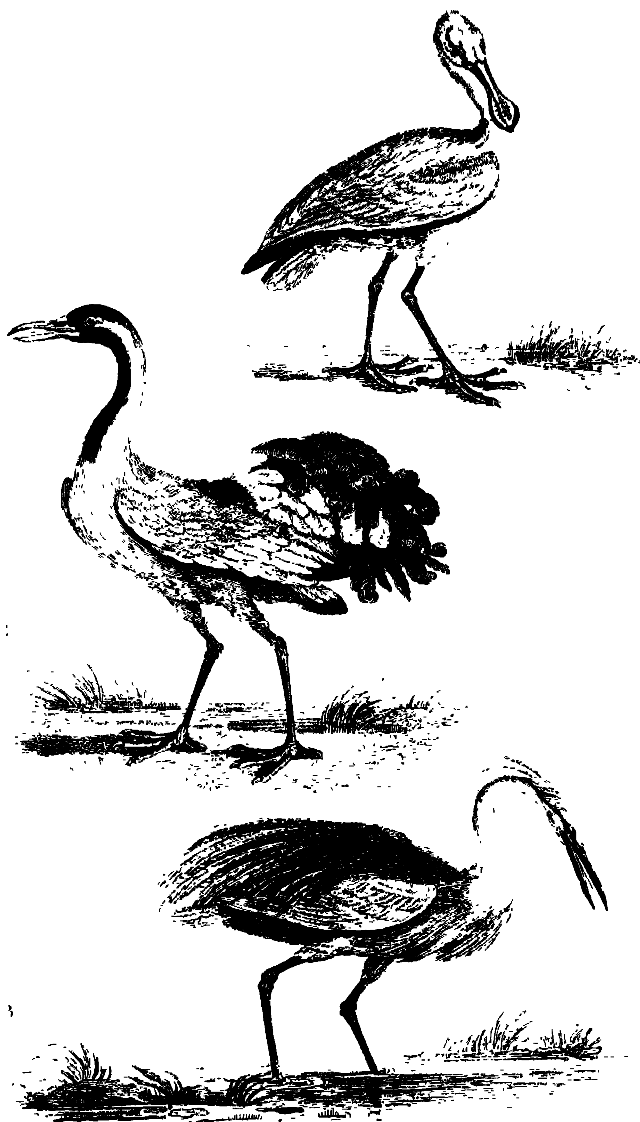
THE classification which has been adopted by Mr. Pennant, and the later naturalists, is peculiarly well calculated to prevent confusion in so numerous a list of genera and species as the description of water-fowl presents to our view. They divide them into three orders, those with cloven feet, or the crane kind, those with pinnated, or finned feet, which are much less numerous than the preceding, or those with webbed feet, or the swan or duck kind. The simplicity of this arrangement is a further recommendation; and with a few exceptions, it appears a classification which completely separates animals that have scarcely any properties in common. If we except the flamingo, the avosetta, and the courier, (which though they are web-footed, certainly partake of the nature of the crane,) all the web-footed fowl are of a squat make, and of a waddling gait, with their legs placed far behind, and their necks in general disproportionably long. The make of the *waders*, or cloven-footed water-fowl, is, on the contrary, tall, light, and, in general, of pleasing proportion. Those with finned feet constitute, as it were, a middle race, being calculated both for swimming and wading, and partake of the nature of both. The cloven-footed lay their eggs on the ground, and make no nests. Those with pinnated feet form large

nests in the water or near it; the web-footed fowl deposit their eggs for the most part on the lofty cliffs, or inaccessible promontories.

In this division of birds, the first which modern naturalists present to our consideration, is the SPOONBILL, a bird remarkable for the curious form of its bill, which in our European spoonbill is six inches and a half long. This species is the size of a heron, or about two feet eight inches long. Its body is more bulky in proportion to its height than most of the crane kind. Yet still it is a comparatively tall bird; it feeds among waters; its toes are divided; and it seems to possess the natural dispositions of the crane. The common colour of those of Europe, is a dirty white; but those of America are of a beautiful *rose colour*, or a delightful crimson. Beauty of plumage seems indeed, to be the prerogative of all the birds of that Continent. The bill which runs out broad at the end, as its name justly serves to denote, is there about an inch and a half wide. This strangely fashioned instrument, in some is black; in others of a light grey; and in those of America, it is of a red colour, like the rest of the body. All round the upper chap there runs a kind of rim, with which it covers that beneath; and for the rest, its cheeks and its throat are without feathers, and covered with a black skin. There is a *dwarf* spoonbill at Surinam, not above the size of a sparrow.

THE HERON. Of this genus Latham has enumerated not less than eighty-two species, all differing in their size, figure, and plumage; and with talents adapted to their place of residence, or their peculiar pursuits. But how various soever the heron kind may be in their colours or their bills, they all seem possessed of the same manners, and have but one character of cowardice and rapacity, indolence, yet insatiable hunger. Other birds are found to grow fat by an abundant supply of food; but these, though excessively destructive and voracious, are ever found to have lean and carrion bodies, as if not even plenty were sufficient for their support.

The common heron is remarkably light in proportion to its bulk, scarce weighing three pounds and a half, yet it expands a breadth of wing which is five feet from tip to tip. Its bill is very long, being five inches from the point to the base; its claws are long, sharp, and the middlemost toothed like a saw. Yet, thus armed as it appears for war, it is indolent and cowardly, and even flies at the approach of a sparrow-hawk. Of all birds, this commits the greatest devastation in fresh-water; and there is scarcely a fish, though ever so large, that he will not strike at and wound, though unable to



1. Spoonbill 2. Crane. 3. Egret.

carry it away. But the smaller fry are his chief subsistence; these, pursued by their larger fellows of the deep, are obliged to take refuge in shallow waters, where they find the heron a still more formidable enemy. His method is to wade as far as he can go into the water, and there patiently wait the approach of his prey, which when it comes within sight, he darts upon with an inevitable aim. In this manner he is found to destroy more in a week than an otter in three months. "I have seen a heron," says Willoughby, "that had been "shot, that had seventeen carps in his belly at once, which he "will digest in six or seven hours. I have seen a carp," continues he, "taken out of a heron's belly, nine inches and a "half long. Several gentlemen who kept tame herons, to try "what quantity one of them would eat in a day, have put "several smaller roach and dace in a tub; and they have "found him eat fifty in a day, one day with another. In this "manner a single heron will destroy fifteen thousand carp in "a single half year.

But, though in seasons of fine weather the heron can always find a plentiful supply; in cold or stormy seasons, his prey is no longer within reach: the fish that before came into shallow water now keep in the deep, as they find it to be the warmest situation. Frogs and lizards also seldom venture from their lurking places; and the heron is obliged to support himself upon his long habits of patience, and even to take up the weeds that grow upon the water. At those times he contracts a consumptive disposition, which succeeding plenty is not able to remove; so that the meagre glutton spends his time between want and riot, and feels alternately the extremes of famine and excess. Hence, notwithstanding the care with which he takes his prey, and the amazing quantity he devours, the heron is always lean and emaciated; and though his crop be usually found full, yet his flesh is scarce sufficient to cover the bones.

Though this bird lives chiefly among pools and marshes, yet its nest is built on the top of the highest trees, and sometimes on cliffs hanging over the sea. They are never in flocks when they fish, committing their depredations in solitude and silence; but in making their nests they love each others society; and they are seen, like rooks, building in company with flocks of their kind. Their nests are made of sticks and lined with wool; and the female lays four large eggs of a pale colour. The observable indolence of their nature, however, is not less seen in their nestling than their habits of depredation. Nothing is more certain, and we have seen it an hundred times, than that they will not be at the trouble of building a nest when they can get one made by the rook, or deserted by the owl,

already provided for them. This they usually enlarge and line within, driving off the original possessors, should they happen to renew their fruitless claims.

The heron is said to be a very long lived bird; by Mr. Keysler's account it may exceed sixty years; and by a recent instance of one that was taken in Holland, by a hawk belonging to the Stadtholder, its longevity is again confirmed, the bird having a silver plate fastened to one leg, with an inscription, importing that it had been struck by the elector of Cologne's hawks thirty-five years before.

Of all the species which have been mentioned above, only three appear to be known in England, the common heron, which we have been describing, and which is blue, the *white heron*, and the *bittern*, or *mire-drum*.

Those who have walked in an evening by the sedgy sides of unfrequented rivers, must remember a variety of notes from different water-fowl: the loud scream of the wild goose, the croaking of the mallard, the whining of the lapwing, and the tremulous neighing of the jack snipe. But of all those sounds, there is none so dismally hollow as the booming of the *bittern*. It is impossible for words to give those, who have not heard this evening-call, an adequate idea of its solemnity. It is like the interrupted bellowing of a bull, but hollower and louder, and is heard at a mile's distance, as if issuing from some formidable being that resided at the bottom of the waters.

The bird, however, that produces this terrifying sound is not so big as a heron, with a weaker bill, and not above four inches long. It differs from the heron chiefly in its colour, which is in general of a palish yellow, spotted and barred with black. Its wind-pipe is fitted to produce the sound for which it is remarkable; the lower part of it dividing into the lungs, is supplied with a thin loose membrane, that can be filled with a large body of air, and exploded at pleasure. These bellowing explosions are chiefly heard from the beginning of spring to the end of autumn; and, however awful they may seem to us, are the calls to courtship, or connubial felicity.

This bird, though of the heron kind, is yet neither so destructive nor so voracious. It is a retired, timorous animal, concealing itself in the midst of reeds and marshy places, and living upon frogs, insects, and vegetables; and though so nearly resembling the heron in figure, yet differing much in manners and appetites. It lays its eggs in a sedgy margin, or amidst a tuft of rushes, and composes its simple habitation of sedges, the leaves of water plants, and dry rushes. It lays generally seven or eight eggs of an ash-green colour, and in three days leads its little ones to their food.

The flesh of the bittern is greatly in esteem among the luxurious. For this reason, it is as eagerly sought after by the fowler as it is shunned by the peasant; and as it is a heavy-rising, slow-winged bird, it does not often escape him. Indeed, it seldom rises but when almost trod upon; and seems to seek protection rather from concealment than flight. At the latter end of autumn, however, in the evening, its wonted indolence appears to forsake it. It is seen rising in a spiral ascent till it is quite lost from the view, and makes at the same time a singular noise very different from its former boomings.

The *Crane* is also a bird which naturalists place in the heron genus. Willoughby and Pennant make the size of this bird from five to six feet long, from the tip to the tail. Other accounts say, that it is above five feet high; and others that it is as tall as a man. A bird, however, the body of which is not larger than that of a turkey-hen, and acknowledged on all hands not to weigh above ten pounds, cannot easily be supposed to be almost as long as an ostrich. Brisson, therefore, seems to give this bird its real dimensions, when he describes it about three feet high, and about four from the tip to the tail. But, perhaps, that from which he took his dimensions, was one of the smallest of the kind.

It is a tall, slender bird, with a long neck and long legs. The top of the head is covered with black bristles, and the back of it is bald and red, which sufficiently distinguishes this bird from the stork, to which it is very nearly allied in size and figure. The plumage, in general, is ash-coloured; and there are two large tufts of feathers, that spring from the pinion of each wing. These bear a resemblance to hair, and are finely curled at the ends, which the bird has a power of erecting and depressing at pleasure. Gesner says, that these feathers, in his time, used to be set in gold, and worn as ornaments in caps.

The crane is a very social bird, and they are seldom seen alone. Their usual method of flying or sitting is in flocks of fifty or sixty together; and while a part feed, the rest stand like centinels upon duty. It for the most part subsists upon vegetables; and is known in every country of Europe, except England. As they are birds of passage, they are seen to depart and return regularly at those seasons when their provision invites or repels them. They generally leave Europe about the latter end of autumn, and return in the beginning of summer. In the inland parts of the continent, they are seen crossing the country, in flocks of fifty or an hundred, making from the northern regions towards the south. In these migrations, however, they are not so resolutely bent

upon going forward, but that if a field of corn offers in their way, they will stop a while to regale upon it; on such occasions they do incredible damage, chiefly in the night; and the husbandman, who lies down in joyful expectation, rises in the morning to see his fields laid entirely waste, by an enemy, whose march is too swift for his vengeance to overtake.

The cold arctic region seems to be this bird's favourite abode. They come down into the more southern parts of Europe rather as visitants than inhabitants.

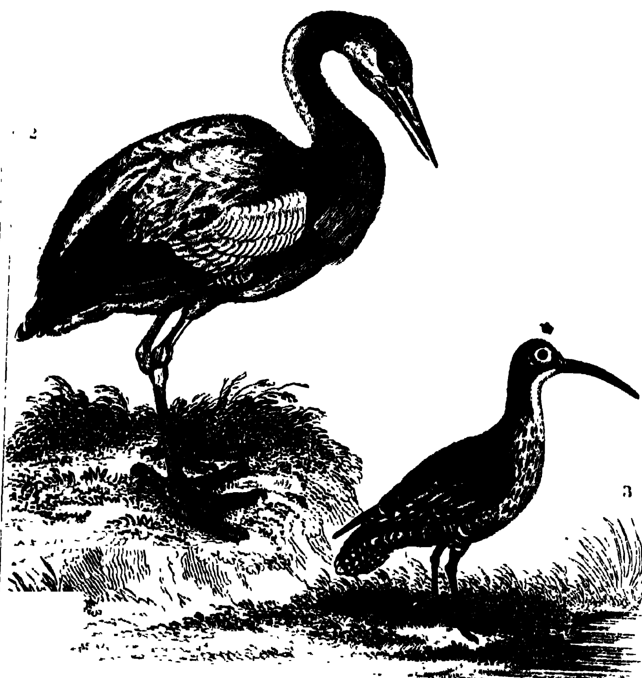
In their journeys it is amazing to conceive the heights to which they ascend, when they fly. Their note is the loudest of all birds; and is often heard in the clouds, when the bird itself is entirely unseen. As it is light for its size, and spreads a large expanse of wing, it is capable of floating, at the greatest heights, where the air is lightest; and as it secures its safety, and is entirely out of the reach of man, it flies in tracks which would be too fatiguing for any other birds to move forward in.

In these aerial journeys, though unseen themselves, they have the distinctest vision of every object below. They govern and direct their flight by their cries; and exhort each other to proceed or descend, when a fit opportunity offers for depredation. As they rise but heavily, they are very shy birds, and seldom let the fowler approach them. Corn is their favourite food; but there is scarcely any other that comes amiss to them. Redi, who opened several, found the stomach of one full of the herb called dandelion; that of another was filled with beans; a third had a great quantity of clover in its stomach; while those of two others were filled with earth-worms and beetles: in some he found lizards and sea-fish; in others, snails, grass, and pebbles, swallowed perhaps for medicinal purposes.

In general it is a peaceful bird, both in its own society, and with respect to those of the forest. It is an animal easily tamed; and if we can believe Albertus Magnus, has a particular affection for man.

The *Egret* is of the crane kind, but only one species is known in Europe, which is called the *little egret*. It is the size of a fowl. The hind head is crested, and two of the feathers, which are five inches in length, hang gracefully behind. The whole plumage is of a beautiful white, and the elegance of the bird is much increased by the long, loose feathers which cover and hang over the rump: their flesh is said to be excellent. It is conjectured that both the crane and egret were formerly inhabitants of Great Britain; but this can





1. Belearic Crane. 2. Common Stork. 3. Curlew.

hardly be said of them at present, notwithstanding a solitary instance or two of their having been shot there. In America there are egrets found of a reddish, and some of a black colour; but they differ in no other respect from the European.

Storks are birds of passage, like the crane, but it is hard to say whence they come or whether they go. When they withdraw from Europe, they all assemble on a particular day, and never leave one of their company behind them. They take their flight in the night; which is the reason the way they go has never been observed. They generally return into Europe in the middle of March, and make their nests on the tops of chimneys and houses as well as of high trees. The females lay from two to four eggs, the size and colour of those of geese. They are a month in hatching; and when their young are excluded, they are particularly solicitous for their safety.

The *Common Stork* is quite *white*, except the greater wing covers and the quills. The *American Stork* nearly answers to the same description; but in the northern countries of Europe there are *Black Storks*, so called from the general appearance of their plumage; they are, however, by no means so numerous as the white.

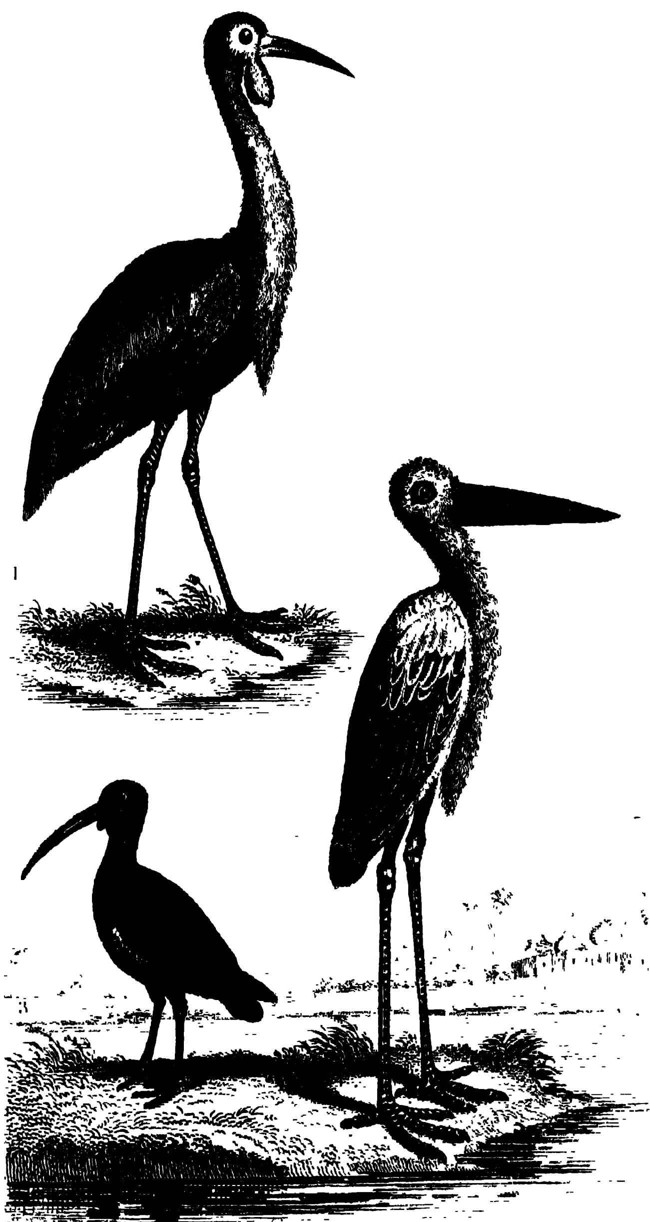
As the food of these birds consists in a great measure of frogs and serpents, it is not to be wondered at that different nations have paid them a particular veneration. The Dutch are very solicitous for the preservation of the stork in every part of their republic. This bird seems to have taken refuge among their towns; and builds on the tops of their houses without any molestation. There it is seen resting familiarly in their streets, and protected as well by the laws as the prejudices of the people.

Many foreign birds of this genus are of extraordinary beauty, size, and singularity; among these the *Crowned Heron*, or *Balearic Crane*, for a long time continued unknown, till we became acquainted with the birds of tropical climates, when one of the crane kind with a topping was brought into Europe, and described by Aldrovandus as Pliny's balearic crane. It is pretty nearly of the shape and size of the ordinary crane, with long legs and a long neck, like others of the kind; but the bill is shorter, and the colour of the feathers of a dark greenish grey. The head and throat form the most striking part of this bird's figure. On the head is seen standing up a thick round crest, made of bristles, spreading every way, and resembling rays standing out in different directions. The longest of these rays are about three inches and an half; and they are all topped with a kind of black tassels, which

give them a beautiful appearance. The sides of the head and cheeks are bare, whitish, and edged with red, while underneath the throat hangs a kind of bag or wattle, like that of a cock, but not divided into two. This bird comes from the coast of Africa and the Cape de Verd Islands. As it runs, it stretches out its wings, and goes very swiftly, otherwise its usual motion is very slow. In their domestic state, they walk very deliberately among other poultry, and suffer themselves to be approached by every spectator. They never roost in houses: but about night, when they are disposed to go to rest, they search out some high wall, on which they perch in the manner of a peacock. Indeed, they so much resemble that bird in manners and disposition, that some have described them by the name of the sea-peacock. But though their voice and roosting be similar, their food, which is entirely greens, vegetables, and barley, seems to make some difference.

The *Gigantic Crane* will frequently measure seven feet and an half, when standing erect, and from the tip of one wing to that of the other, fourteen feet ten inches. The head and neck are naked, and of a yellowish colour. The feathers on the back and wings are of an iron colour, those of the breast and belly of a dirty white. The craw hangs down on the fore-part of the neck, like a pouch, and the lower part is hairy. These birds are gregarious, and when their wings are spread appear like a number of canoes on the surface of the water. They may be easily tamed, and become so familiar that a young one at the King of the Bananas in Africa became so troublesome, that the servants were obliged to guard the provisions by beating it off with switches; but notwithstanding this, it commonly purloined something, and one day was known to swallow at a mouthful a whole boiled fowl. It was accustomed to roost very high among the cotton trees, whence, at two or three miles distance, it could spy the dinner carrying across the yard, when darting from its station, it would enter promiscuously with the persons who carried in the dishes. This monster inhabits the southern parts of Africa and India. It preys upon birds, reptiles, and small quadrupeds. On opening one of them a land tortoise, ten inches long, and a large black cat were found entire in its stomach.

The *Wattled Heron* is a very curious bird. The top of the head is blue-grey, the rest of the head and neck white, under the chin are two wattles covered with white feathers. The back and wings are blue grey, and the quills and belly are black. This bird is a native of Africa.



1. Mottled Heron. 2. Gigantic Crane. 3. Black-faced He

One bird more may be subjoined to this genus, not for the oddity of its figure, but the peculiarity of its manners. It is vulgarly called by our sailors, the *buffoon* bird, and by the French the *demoiselle*, or lady. The peculiar gestures and contortions of this bird, the proper name of which is the *Numidian Crane*, are extremely singular. It stoops, rises, lifts one wing, then another, turns round, sails forwards, then back again; all which highly diverts our seamen; not imagining, perhaps, that all these contortions are but the awkward expression not of the poor animal's pleasures, but its fears.

It is a very scarce bird; the plumage is of a leaden grey, but it is distinguished by fine white feathers consisting of long fibres, which fall from the back of the head, about four inches long; while the fore-part of the neck is adorned with black feathers, composed of very fine, soft, and long fibres, that hang down upon the stomach, and give the bird a very graceful appearance.

THE IBIS scarcely deserves the name of an European bird, since only one species is found there; viz. the *Bay Ibis*, which is not larger than a curlew, or one foot nine inches long. The upper parts of the body are glossy-green, and the lower parts are brown, with a gloss of gold on the breast. It inhabits Italy, some parts of Germany, and about the Caspian and Black Seas.

The *Egyptian Ibis*, so famous in history and mythology, is larger than the stork, measuring from thirty to forty inches in length. The bill is seven inches long, is slightly curved, and ends in a blunt point. The plumage is a reddish-white, most inclining to red on the back and wings. It is found in great numbers in Lower Egypt, in places just freed from the inundations of the Nile, where it is of signal service in destroying insects, reptiles, &c. This bird is frequently found in the sepulchres along with the mummies, and was formerly held sacred by the Egyptians.

The *Black-faced Ibis* is in length about twenty-eight inches. The whole face quite beyond the eyes, is bare of feathers, black and warty, and under the chin hangs a loose, wrinkled skin, forming a pouch. The head, neck and breast are yellow, with a bar of ash-colour across the latter; the rest of the body is ash-colour. It was found on New Year's Island, near Staten Land.

THE CURLEW is a well known bird, which in winter frequents our sea-coasts and marshes, feeding chiefly on frogs and marine insects. In summer they retire to the mountainous and unfrequented parts to breed. Their flesh is rank and fishy. Curlews differ much in size, some weighing thirty-seven ounces, and some not twenty-two; the length of the largest is twenty-five inches. The upper parts of the plumage are of a pale-brown; the breast and belly white, marked with dark oblong spots. Latham enumerates about eleven species, foreign and domestic.

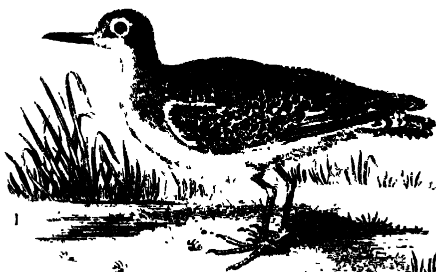
THE SNIPE genus includes better than thirty species. Of these the *Woodcock* is the most esteemed by the epicures. The *Godwit* is less known:—It weighs twelve ounces and a half, and is in length sixteen inches. From the bill to the eye is a broad white stroke. The plumage on the upper parts is of a light reddish-brown, the belly white, the quills are blackish. They are taken in the fens, and when fattened, are esteemed a great delicacy. The *Red Godwit* is larger, but less common in England.

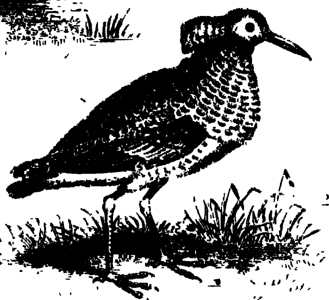
The *Green-shank* is not so common as the godwit: It is about fourteen inches in length; the bill two inches and a half long. The plumage on the upper parts is a brown ash colour; on the lower parts white: The legs are green, whence it takes its name. It has the same manners and character as the godwit, and has also a white line over the eye; but does not weigh more than half as much.

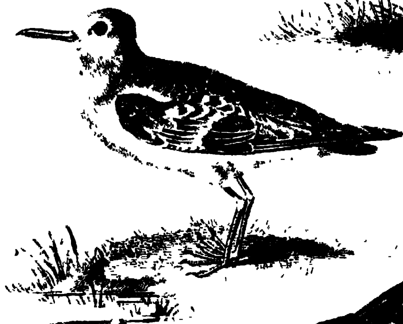
The *Red-shank* weighs about five ounces and a half, and is twelve inches long. The bill is two inches, red at the base, and black towards the point. The head, neck, and scapulars are dusky ash-colour, obscurely spotted with black; the back is white, spotted with black.: The breast is white, streaked with dusky lines. When its nest is in danger, it makes a noise somewhat similar to that of the lapwing,

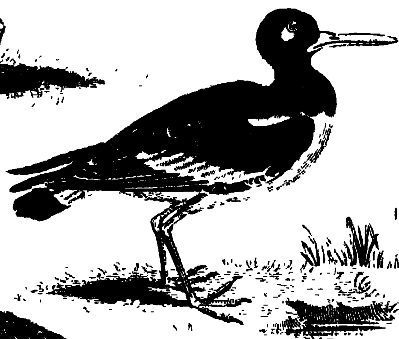
The *Common Snipe* weighs about four ounces; but there is a species, though exceedingly rare, which is more than double that weight. The *Jack Snipe* was formerly supposed to be the male snipe, from its frequenting the same haunts; it is, however, now well known to be a different species. It weighs scarcely two ounces.

THE SANDPIPER genus includes of well-known birds, the *Lapwing*, the *Ruff*, the *Knot*, the *Purro*, the *Turnstone*, and the *Dunlin*. The first of these is too common a bird to require a particular description. The *Ruff* is an animal less generally known, being confined to the north of Europe,











1. Sandpiper 2. Ruff 3. Sanderling 4. Oyster Catcher
5. Marsh Crake

during the summer, and in England only visiting certain parts, viz. Lincolnshire, the Isle of Ely, and the adjacent parts of Yorkshire, in the spring. The male, which is called the *Ruff*, from the remarkable bunch of feathers which surrounds its neck just below the head, is so various in its plumage, that it is not easily described; the ground is, however, mostly brown. The female, which is called the *Reeve*, is less than the ruff, and has her plumage more of a uniform brown. This bird is so noted for its contentious spirit, that it has obtained the epithet of the fighter. In the beginning of spring, when these birds arrive among our marshes, they are observed to engage, with desperate fury, against each other. It is then that the fowlers, seeing them intent on mutual destruction, spread their nets over them, and take them in great numbers: yet, even in captivity, their animosity still continues. The people that fatten them up for sale, are obliged to shut them up in close, dark rooms; for if they let ever so little light in among them, the turbulent prisoners instantly fall to fighting with each other, and never cease till each has killed its antagonist, especially, says Willoughby, if any body stands by. A similar animosity, though in less degree, prompts all this tribe; but when they have paired, and begun to lay, their contentions are then over.

The *Knot* is three inches less than the ruff, measuring not more than nine inches, and weighing only four ounces and a half. The head and neck are ash colour, the back and scapulars brown, with a white bar on the wings. They frequent the coast of Lincolnshire from August to November, and when fattened, are preferred by some to the ruffs themselves.

The *Purro*, or *Stint*, weighs only an ounce and an half, and is in length seven inches. A white stroke divides the bill and eyes. The upper parts of the plumage are brownish ash colour, the breast and belly white, as are the lower parts of the quill feathers. These birds come in vast flocks on our sea-coasts in winter, and in their flight observe uncommon regularity, appearing like a white or a dusky cloud. They were formerly a frequent dish at our tables, known by the name of stints.

The *Turnstone* is about the size of a thrush. The bill is nearly an inch long, and turns a little upwards. The head, throat, and belly, are white, the breast black, and the neck encircled with a black collar. The upper parts of the plumage are of a pale reddish brown. These birds take their name from their method of finding their food, which is by turning up small stones with their bills, to get at the insects which lurk under them.

The *Dunlin* is the size of a jack snipe. The upper parts of the plumage are ferrugineous, marked with large spots of black, and a little white; the lower parts are white, with dusky streaks. It is found in all the northern parts of Europe.

Of the *Sandpiper*, properly so called, there are about twelve species known in Europe, from the size of a thrush to that of a hedge-sparrow. The common sandpiper is in weight about two ounces: The head is brown, streaked with black, the back and coverts brown, mixed with glossy-green; the breast and belly pure white. Its note is louder and more piping than others of this genus. The *black*, the *green*, the *spotted*, the *red*, and the *gambel* sandpiper, are not very common in England.

The genus includes forty species, foreign and domestic.

Under the description of PLOVER about twenty-four species are comprehended.

The *Golden*, or *Green Plover*, is a well-known bird, and is found in small flocks, in the winter-time, on all our moors, heaths, &c. It is remarkable for the whole of its plumage being elegantly variegated with a fine, yellowish-green. It may be enticed within gun-shot, by a skilful imitator of their voice, and is esteemed as a delicacy. It is eleven inches in length, and weighs nine ounces.

The *Long-legged Plover* is a singular bird. Though inferior in size to the golden plover, it measures nearly a foot and a half when standing erect, on which account it has been called the red legged crane. The head, back, and wings are glossy black, the rump and belly white. It is found in most quarters of the world, but is very uncommon in England.

The *Dotterel* is about ten inches in length, and weighs four ounces. The bill is shorter than that of the majority of this genus, being only an inch long. The head is black, spotted with white, and a white stroke runs over each eye meeting behind. The upper parts of the plumage are greyish brown margined with a dull deep yellow. The breast is a dull orange, and across it is a streak of white margined above with black. The colours of the female are less vivid. It is esteemed a very foolish bird; and was believed to mimick the actions of the fowler, to stretch out a wing when he stretched out an arm, &c. regardless of the net which was spreading for it. They appear in England in small flocks from April to September.

The *Sanderling* is eight inches long, but weighs only an ounce and three quarters. The bill is very weak and black, and an inch long. The head and neck are ash coloured

streaked with black, the wings and back brownish grey edged with white; all the under parts of the body are white. It is found in many parts of both continents, and is very plenty on the coasts of Lancashire and Cornwall.

The *Ringed Plover* is seven inches and a half long, though it weighs two ounces; the bill is half an inch long and from it to the eyes runs a black line. The upper part of the neck is encircled with a white collar, the lower part with a black one. The back and wings are light brown, the breast and belly are white, the legs yellow. They frequent our shores in summer, and are sometimes known by the name of the *Sea Lark*.

The Oyster Catcher is about the size of a crow, and is well known on our coasts under the name of the Sea-pie. Its bill is three inches in length, and of an orange colour. The head, neck, back and quills are black, except a crescent of white, which runs across the throat; the belly, rump and greater wing coverts are also white, and the tip of the tail black. It receives its name from its feeding upon shell fish, and particularly oysters, which when it observes on any occasion gaping wide enough for the insertion of its bill, it thrusts it in, and without further ceremony deprives the shell of its inhabitant. We know of but one species, which is diffused over all quarters of the globe.

These five last genera have a strong affinity with each other, and all are distinguished by similar manners. As they are usually employed rather in running than in flying, and as their food lies entirely upon the ground, and not on trees, or in the air, so they run with great swiftness for their size, and the length of their legs assists their velocity. But as, in seeking their food, they are often obliged to change their station, so also they are equally swift of wing, and traverse immense tracts of country without much fatigue.

It has been thought by some, that a part of these birds lived upon an oily slime, found in the bottoms of ditches and of weedy pools; but later discoveries have shewn, that, in these places, they hunt for the caterpillars, worms, and insects. The long billed birds suck up worms and insects from the bottom; those furnished with shorter bills, pick up such insects as lie nearer the surface of the meadow, or among the sands on the sea-shore.

As all of this kind live entirely in waters, and among watery places, they seem provided by nature with a warmth of constitution to fit them for that cold element. They reside, by choice, in the coldest climates; and, as other birds migrate here in our summer, their migrations hither are mostly

in the winter. Even those that reside among us the whole season, retire in summer, to the tops of our bleakest mountains; where they breed, and bring down their young when the cold weather sets in.

The curlew, the woodcock; the snipe, the godwit, the golden, and the long-legged plover, the knot, and the turnstone, are rather the guests than the natives of this island, though the nest of a straggling curlew, or a snipe, is sometimes found in our marshes. They visit us in the beginning of winter, and forsake us in the spring. They then retire to the mountains of Sweden, Poland, Prussia, and Lapland, to breed. Our country, during the summer season, becomes uninhabitable to them. The ground parched up by the heat, the springs dried away, and the vermicular insects already upon the wing, they have no means of subsisting. Their weak and delicately-pointed bills are unfit to dig into a resisting soil; and their prey is departed, though they were able to reach its retreats. Thus, that season when nature is said to teem with life, and to put on her gayest liveries, is to them an interval of sterility and famine.

The lapwing, the ruff, the red-shank, the sandpiper, the oyster catcher, and the ringed plover, breed in this country, and, for the most part, reside here. In summer, they frequent such marshes as are not dried up in any part of the year; the Essex hundreds, and the fens of Lincolnshire. There, in solitudes formed by surrounding marshes, they breed and bring up their young. In winter, they come down from their retreats, rendered uninhabitable by the flooding of the waters, and seek their food about our ditches and marshy meadow-grounds. Yet, even of this class, all are wanderers upon some occasions, and take wing to the northern climates, to breed, and find subsistence. This happens when our summers are peculiarly dry, and when the fenny countries are not sufficiently watered to defend their retreats.

As all these birds run and feed upon the ground, so they are all found to nestle there. The number of eggs generally to be seen in every nest, is from two to four; never under, and very seldom exceeding. The nest is made without any art; but the eggs are either laid in some little depression of the earth, or on a few bents and long grass, that scarcely preserve them from the moisture below.

The place these birds chiefly choose to breed in, is in some island surrounded with sedgy-moors, where men seldom resort; and in such situations, we have often seen the ground so strewed with eggs and nests, that one could scarce take a step without treading upon some of them. The arts of the

lapwing to allure men or dogs from her nest, are perfectly amusing. When she perceives the enemy approaching, she never waits till they arrive at her nest, but boldly runs to meet them. When she has come as near them as she dares to venture, she then rises with a loud screaming before them, seeming as if she were just flushed from hatching; while she is then probably a hundred yards from the nest. Thus she flies, with great clamour and anxiety, whining and screaming round the invaders, striking at them with her wings, and fluttering as if she were wounded.

Only three species of the PRATINCOLE are known by naturalists, with some varieties. That which is called the *Austrian Pratincole* is the size of a blackbird, with a short curved bill. The upper parts of the body are greyish brown, and the throat is white, surrounded with a black line, which commences at each eye. The tail is forked. It is an inhabitant of Germany, where there is also a spotted kind. It has been called by foreign naturalists the *Sea Partridge*.

Of the RAIL there are about twenty-two species foreign and domestic.

The *Water Rail*, or brook ouzle is a bird well-known in these parts of Europe. It is a large slender bird, with a bill one inch and three quarters long. Its weight is four ounces and a half. The upper parts of the plumage are black, edged with olive brown, the lower parts ash-coloured. It is generally found on the edges of ponds or brooks well furnished with cover. It will sometimes take the water, where it swims tolerably well. This is the only species which is known in England, and we believe in Europe. The foreign birds of this genus are numerous, and much diversified in their plumage.

THE GALLINULE also includes about twenty-two species, of which only five or six are common to Europe and but three are known in Great Britain.

The *Crake* is a bird well known in many parts of Great Britain, but it is still more common in Ireland. In shape it much resembles the water-rail, and was once erroneously supposed to be the same bird, differing only by a change of colour, at a certain season of the year. The bill, however, in this species is short and thick, exactly resembling in shape that of the common gallinule or water-hen, from which it however differs, not only in its plumage, which is a reddish brown, but in its habits, as it never frequents watry places, but

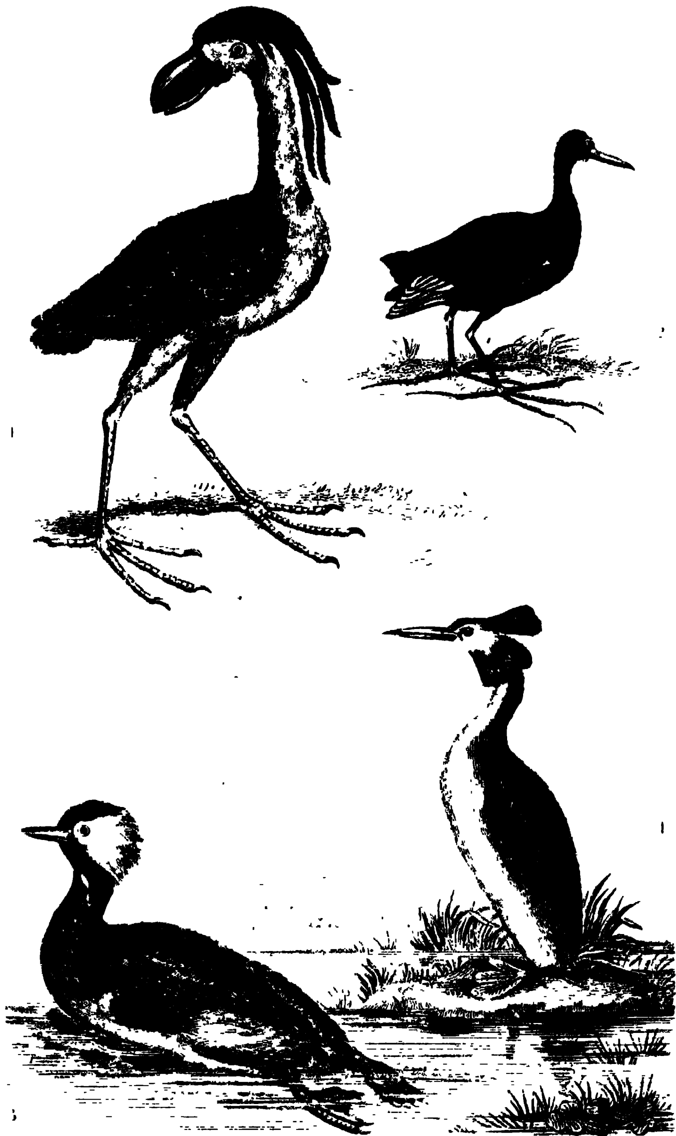
is always found in grass, corn or furze. With us it is a bird of passage, and on its first arrival about April, is very lean, not weighing more than six ounces; but before its departure it weighs more than eight. The flesh is good food.

The *common Gallinule* or *Water-hen* weighs fifteen ounces. Its bill is red, and covered at the base with a red membrane. The plumage above is sooty black, beneath ash-coloured. As the birds of the crane kind are furnished with long wings, and easily change place, the water-hen, whose wings are short, is obliged to reside entirely near those places where her food lies: she never leaves the side of the pond or the river in which she seeks for provision. She builds her nest upon low trees and shrubs, of sticks and fibres, by the water side. She lays twice or thrice in a summer. Her young ones swim the moment they leave the egg, pursue the parent, and imitate all her manners. She rears, in this manner, two or three broods in a season: and when the young are grown up, she drives them off, to shift for themselves.

The *spotted Gallinule* is a less common bird: and in Russia and some other parts of Europe a species is found, which from its colour, is called the *purple Gallinule*, which is the size of a common fowl.

Of the foreign birds of this order, it is proper to mention the JABIRU of India and of Brasil. Of these great birds we know but little, except the general outline of their figure and the enormous bills which we often see preserved in the cabinets of the curious. The bill of the latter is red, and thirteen inches long: the bill of the former is of a dusky colour. Neither of them, however, are of a size proportioned to their immoderate length of bill. The jabiru of Brasil is in length about six feet. They are both covered with white feathers, except the head and neck, that are naked; and their principal difference is in the size of the body and the make of the bill; the lower chap of the jabiru of Brasil being broad, and bending upwards.

A bird still more extraordinary is included in this order, called the ANHIMA or SCREAMER, and like the former, a native of Brasil. This is a water-fowl of the rapacious kind, and bigger than a swan. The head, which is small for the size of the body, bears a black bill, which is not above two inches long; but what distinguishes it in particular is a horn growing from the forehead as long as the bill, and bending forward like that of the fabulous unicorn of the antients. This horn is not much thicker than a crow-quill, as round as



1. *Boatbill* 2. *Jacana* 3. *Eared Grebe.*
4. *Crested Grebe*

if it were turned in a lathe, and of an ivory colour. But this is not the only instrument of battle this formidable bird carries; it seems to be armed at all points; for at the fore-part of each wing, at the second joint, spring two straight triangular spurs, about as thick as one's little finger: the foremost of these goads or spurs is above an inch long; the hinder is shorter, and both of a dusky colour. The claws also are long and sharp; the colour is black and white; and they cry terribly loud. They are never found alone, but always in pairs; the cock and hen prowl together; and their fidelity is said to be such, that when one dies, the other never departs from the carcase, but dies with its companion. It makes its nest of clay, near the bodies of trees, upon the ground, of the shape of an oven. There is another species of Screamer which is crested and without the horn.

The Boatbill is also a native of America. It is about the size of a common fowl. The general colour of the bill is dusky, and the skin beneath the under jaw is capable of distention. From the hind head springs a long black crest. The plumage on the forehead is white, and the rest of the bird is a pale bluish ash colour; and the feathers which hang over the breast, are loose, like those of the heron. There are varieties of this bird, both spotted and brown, but they appear simple varieties, and not at all entitled to the denomination of species. Like the king-fisher, it preys upon fish, by perching on trees which over-hang the streams, and dropping on the fish as they swim by it.

The Umbre is the size of a crow, and not much differing in colour, as it is of a deep brown, or umbre. The bill is three inches and a half in length, with a furrow on each side the upper mandible, and from the head springs a large crest of loose feathers, better than four inches in length. The bird now described came from the Cape of Good Hope. We know of but one species.

The Jacana is found in most of the tropical climates, but is most common in South America. It is remarkable for the length of its toes, and for the wings being armed in front with sharp spurs. There are about ten species differing in size from that of a common fowl to that of a water-rail. They vary also in their plumage, some being brown, some black, and some variable. The *faithful Jacana* is a most useful bird at Carthagena in South America. The natives, who keep poultry in great numbers, have one of these

tame, who attends the flock as a shepherd, to defend them from birds of prey. Though not larger than a dunghill cock, the Jacana is able, by means of the spurs on his wings, to keep off birds as large as the carrion vulture, and even that bird himself; and it never deserts its charge, but assiduously takes care to bring the whole flock home safe at night. It feeds on vegetables, and cannot run but by the help of its wings.

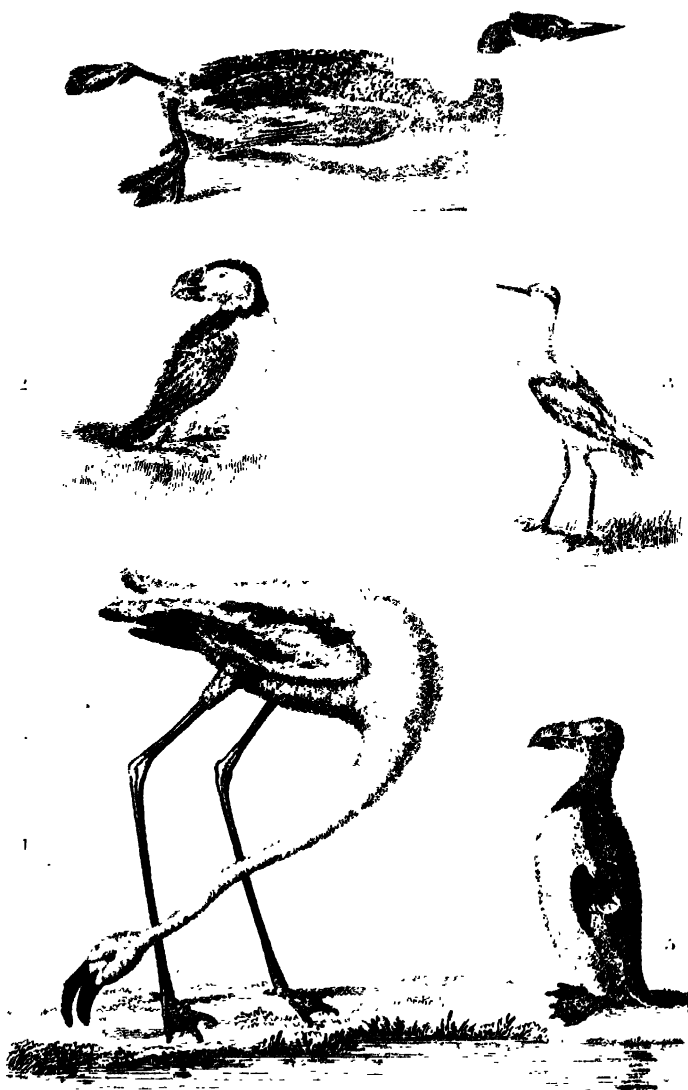
THE SHEATHBILL is an inhabitant of New Zealand, and is remarkable for a horny sheath which covers the upper part of its bill, which is also moveable, and may be raised upwards or laid flat on the bill. We know of but one species, which is as large as a pigeon, and as white as snow. They feed on shell-fish and carrion.

Water-fowl with pinnated (or finned) feet.

Of this description of birds we know only three kinds. Their general characteristic is that of having their toes furnished with jagged or scolloped membranes, which probably may assist them in swimming. They appear indeed in every respect an intermediate race between the tall and slender birds of the crane form, and the common web-footed water-fowl.

THE PHALAROPE is in every respect but the above characteristic, formed like the sandpiper. It is the size of the purro, and weighs one ounce. The *grey Phalarope* has the upper parts of the plumage ash coloured, varied a little with dusky and white, and the breast and belly white. The *red Phalarope* only differs from it in having the upper parts of the plumage of a deep lead colour, striped with dusky yellow; and the under parts of a dusky red. These are sometimes found in England, and there are about three foreign species.

THE COOT is a well-known bird. It weighs from twenty-four to twenty-eight ounces. The bald part of the head, which in the water-hen is red, in the coot is white. The upper parts of its plumage are black, the breast and belly white. As the coot is a larger bird than the water-hen, which it much resembles, it is always seen in larger streams, and more remote from mankind. It there makes a nest of such weeds as the stream supplies, and lays them among the reeds, floating on the surface, and rising and falling with the water. The reeds among which it is built, keep it fast; so that it is seldom washed into the middle of the stream. But if this happens,



1. Red necked Grebe. _ 2. Puffin. 3. Scooping Avoset. _ 4. Flamingo. 5. Great Auk.

which is sometimes the case, the bird sits in her nest, like a mariner in his boat, and steers, with her legs, her cargo into the nearest harbour; there, having attained her port, she continues to sit in great tranquillity, regardless of the impetuosity of the current; and, though the water penetrates her nest, she hatches her eggs in that wet condition. In Madagascar there is a coot with a red comb like a cock.

To these birds with long legs and finny toes, we will add one genus more, with short legs and finny toes: viz. the GREBE. It is much larger than either of the former, and its plumage white and black. It differs also entirely in the shortness of its legs, which are made for swimming, and not walking: in fact, they are, from the knee upward, hid in the belly of the bird, and have consequently very little motion. By this mark, and by the scolloped fringe of the toes, this bird may be easily distinguished from all others.

As they are thus, from the shortness of their wings, ill-formed for flying, and, from the uncommon shortness of their legs, utterly unfitted for walking, they seldom leave the water, and chiefly frequent those broad, shallow pools where their faculty of swimming can be turned to the greatest advantage, in fishing and seeking their prey.

They are chiefly, in England, seen to frequent the meres of Shropshire and Cheshire; where they breed among reeds and flags, in a floating nest. It is never seen on land; and, though disturbed ever so often, will not leave that lake where alone, by diving and swimming, it can find food and security. It is chiefly sought for the skin of its breast, the plumage of which is of a most beautiful silvery white, and as glossy as satin.

Of the grebe kind there are about thirteen species. The most common is the *crested grebe*. The *eared Grebe* is the size of a teal, and is distinguished by a tuft of orange coloured feathers, which spring from behind each eye; it is a native of Siberia. There is a still more beautiful species, viz. the *red-necked grebe*; the chin of which is pale ash colour, the rest of the neck of a reddish chesnut.

CHAP. XXVIII.

Of web-footed water-fowl—The Avoset—*Scooping, American and White Avoset—The* Courier—*The* Flamingo—*The* Ank—*The Great Ank—The Razor-bill—The Puffin—The Little Ank—The Tufted and Crested Ank, &c.—The* Guillemot—*The Foolish, Lesser, and Marbled Guillemot—The* Diver—*The Northern, Speckled Black and Red-throated Diver—The Chinese Diver—The* Tern—*The Great, Lesser, Black, and Striated Tern—The Noddy—The* Petrel—*The Fulmar—The Shearwater—The Stormy Petrel—The Giant Petrel—The* Gull—*The Black-backed, Skua, Wagel, Herring-gulls, &c.—The Kittiwake—The Common Gull—The Black-cap, &c.—Modes of taking Sea-fowl—The* Merganser—*The Gooseander—The Dun-Diver—The Smew—The Hooded Merganser—The* Duck—*The Swan—The Goose—The Bean Goose—The Barnacle—The Brent Goose—The Mallard—The Eider Duck—The Velvet, Scoter, Tufted and Scaup Duck—The Golden Eye—The Shoveller—The Pintail—The Pochard—The Long-tailed Duck—The Wigeon—The Teal—The Muscovy, Brasilian, American, and Chinese Ducks—Decoy for Ducks—The* Pelican—*The Frigate-Pelican, or Man-of-War Bird—The Corvorant—The Shag—The Gannet, or Soland Goose—The Booby—The* Albatross—*The Yellow-nosed Albatross—The* Skimmer—*The* Penguin—*The Patagonian Penguin—The Magellanic Penguin—The* Tropic Bird—*The* Darter—*The White and Black-bellied Darters.*

OF the web-footed water-fowl, the few which are distinguished by the name of *long-legged* have so near an affinity with the birds of the preceding order, that some naturalists have classed them among the cranes, or waders; and, indeed, were it not for the very accurate distinction which the form of the foot affords, analogy would direct us to this arrangement in preference to every other.

The Avoset is easily distinguished from all other birds by the form of its bill, which is very thin, slender, and bends considerably upwards. The *Scooping Avoset* is about the size of the lapwing, or eighteen inches long; the bill is three inches and an half in length. The top of the head is black, the rest of the head, neck, and all the other parts of the body white, except the inner scapulars, the middle of the wing coverts and outer webs, and ends of the quills, which again

are black. It weighs about thirteen ounces, and is frequent in the winter, on most of the sea-coasts of Europe, as well as in the Fens of Lincolnshire, Cambridge, &c. It feeds on worms and insects, which it scoops out of the sand with its bill. The *American Avoset* differs only in being something larger, and having the neck and breast of a deep cream-colour. In Hudson's Bay there is a *White Avoset.*

THE COURIER is an Italian bird, somewhat less than the avoset, the bill is shorter, strait, and yellow. The upper parts of the plumage of a rusty-brown, the under parts white. It is remarkable for its swiftness in running, from which property it derives its name.

THE FLAMINGO is, perhaps, the most remarkable of water-fowl; it is one of the tallest, and the most beautiful. The body, which is of a beautiful scarlet, is no bigger than that of a swan; but its legs and neck are of such an extraordinary length, that when it stands erect, it is six feet six inches high. Its wings, extended, are five feet six inches from tip to tip; and it is four feet eight inches from tip to tail. The head is round and small, with a large bill, seven inches long, partly red, partly black, and crooked like a bow. The legs and thighs, which are not much thicker than a man's finger, are about two feet eight inches high; and its neck near three feet long. The feet are feeble, and united by membranes, as in those of the goose. Of what use these membranes are does not appear, as the bird is never seen swimming, its legs and thighs being sufficient to bear it into those depths where it seeks for prey.

This extraordinary bird is now chiefly found in America, but was once known on all the coasts of Europe. Its beauty, its size, and the peculiar delicacy of its flesh, have been such temptations to destroy or take it, that it has long since deserted the shores frequented by man, and taken refuge in countries that are as yet but thinly peopled.

When the Europeans first came to America, and coasted down along the African shores, they found the flamingos on several shores on either continent gentle, and no way distrustful of mankind. When the fowler had killed one, the rest of the flock, far from attempting to fly, only regarded the fall of their companion in a kind of fixed astonishment: another and another shot was discharged; and thus the fowler often levelled the whole flock, before one of them began to think of escaping.

But at present it is very different in that part of the world; and the flamingo is not only one of the scarcest but of the shyest birds in the world, and the most difficult of approach. They chiefly keep near the most deserted and inhospitable shores; near salt-water lakes and swampy islands. When seen by mariners in the day, they always appear drawn up in a long close line of two or three hundred together; and, as Dampier tells us, present, at the distance of half a mile, the exact representation of a long brick wall. Their rank, however, is broken when they seek for food; but they always appoint one of the number as a watch, whose only employment is to observe and give notice of danger while the rest are feeding. As soon as this trusty centinel perceives the remotest appearance of danger, he gives a loud scream, with a voice as shrill as a trumpet, and instantly the whole cohort are upon the wing. The flesh of the old ones is black and hard, though, Dampier says, well tasted: that of the young ones is better. But, of all delicacies, the flamingo's tongue is the most celebrated. In fact, the Roman Emperors considered them as the highest luxury; and we have an account of one of them, who procured fifteen hundred flamingo's tongues to be served up in a single dish. The tongue of this bird, which is so much sought after, is a good deal larger than that of any other bird whatever. The bill of the flamingo is like a large black box, of an irregular figure, and filled with a tongue which is black and gristly.

Their time of breeding is according to the climate in which they reside: in North America they breed in our summer; on the other side the line they take the most favourable season of the year. They build their nests in extensive marshes, and where they are in no danger of a surprize. The nest is not less curious than the animal that builds it: it is raised from the surface of the pool about a foot and a half, formed of mud, scraped up together, and hardened by the sun, or the heat of the bird's body: it resembles a truncated cone, or one of the pots which we see placed on chimnies; on the top it is hollowed out to the shape of the bird, and in that cavity the female lays her eggs, without any lining but the well cemented mud that forms the sides of the building. She always lays two eggs, and no more; and, as her legs are immoderately long, she straddles on the nest, while her legs hang down, one on each side into the water. The young ones are a long while before they are able to fly; but they run with amazing swiftness. They are sometimes caught; and, very different from the old ones, suffer themselves to be carried home, and are tamed very easily.

The first European bird of the web-footed fowls with short legs, which naturalists introduce to our notice is the ANK, of which there are about twelve species foreign and domestic. The whole tribe is distinguished peculiarly by the form of the bill, which is strong, convex, compressed at the sides, in general crossed with several furrows, and in some degree resembling the coulter of a plough.

The *Great Ank* is the size of a goose; its bill is black, about four inches and a quarter in length, and covered at the base with short velvet-like feathers. The upper parts of the plumage are black, and the lower parts white, with a spot of white between the bill and the eyes, and an oblong stripe of the same on the wings, which are too short for flight. The bird is also a very bad walker, but swims and dives well. It is, however, observed by seamen, that it is never seen out of soundings, so that its appearance serves as an infallible direction to land. It feeds on the lump-fish and others of the same size; and is frequent on the coasts of Norway, Greenland, Newfoundland, &c. It lays its eggs close to the sea mark.

The *Razor-bill* is not above half the size of the preceding, which it resembles both in form and plumage, except that it has the use of its wings, and lays its egg, (for each of these species lay but one) on the bare top of a precipice, and fastens it by a cement so as to prevent its rolling off. It is pretty common on the coasts of England during the summer season. The *black-billed Ank* is still smaller.

The *Puffin* is the size of the teal, weighs about twelve ounces, and is twelve inches in length. The bill is much compressed; the half next the point is red, that next the base is blue grey. It has three furrows or grooves impressed in it; one in the livid part, two in the red. The eyes are fenced with a protuberant skin, of a livid colour; and they are grey or ash-coloured.

The puffin, like all the rest of this kind, has its legs thrown so far back, that it can hardly move without tumbling. This makes it rise with difficulty, and subject to many falls before it gets upon the wing; but as it is a small bird, when it once rises, it can continue its flight with great celerity.

All the winter these birds are absent, visiting regions too remote for discovery. At the latter end of March, or the beginning of April, come over a troop of their spies or harbingers, that stay two or three days, as it were to view and search out for their former situations, and see whether all be well. This done, they once more depart; and, about the beginning

of May, return again with the whole army of their companions. But if the season happens to be stormy and tempestuous, and the sea troubled, the unfortunate voyagers undergo incredible hardships; and they are found, by hundreds, cast away upon the shores, lean and perished with famine.

The puffin, when it prepares for breeding, which always happens a few days after its arrival, begins to scrape out an hole in the ground not far from the shore; and when it has some way penetrated the earth, it then throws itself upon its back, and with its bill and claws thus burrows inward, till it has dug a hole with several windings and turnings, from eight to ten feet deep. It particularly seeks to dig under a stone, where it expects the greatest security. In this fortified retreat it lays one egg; which, though the bird be not much bigger than a pigeon, is of the size of a hen's.

Few birds or beasts will venture to attack them in their retreats. When the great sea-raven comes to take away their young, the puffins boldly oppose him. Their meeting affords a most singular combat. As soon as the raven approaches, the puffin catches him under the throat with its beak, and sticks its claws into its breast, which makes the raven, with a loud screaming, attempt to get away; but the little bird still holds fast to the invader, nor lets him go till they both come to the sea, where they drop down together, and the raven is drowned: yet the raven is but too often successful; and invading the puffin at the bottom of its hole, devours both the parent and its family.

The *little ank* is still less than the puffin, being not above the size of a blackbird.

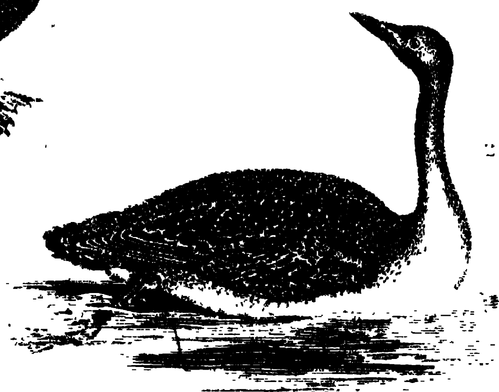
Of the foreign birds of this genus, the *tufted ank* is one of the most curious. It is somewhat bigger than the puffin, and is distinguished by a tuft of feathers four inches in length, which arises over each eye, and falls elegantly on each side of the neck. It is found at Kamschatka.

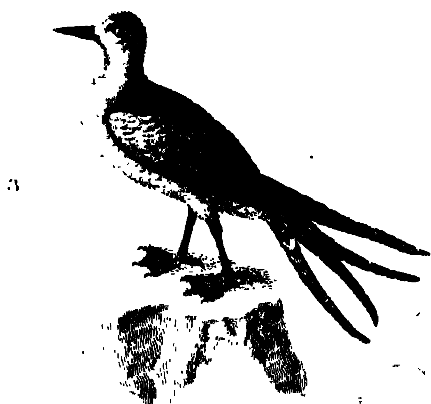
The *crested ank* is perhaps still more remarkable, having its head adorned with a crest, composed of long feathers, and which curves forward over the bill. This bird inhabits the islands contiguous to Japan. Besides these, there are the *parroquet* and *dusky ank*, and some other species of less note.

The Guillemot is nearly allied to the preceding genus, but it wants the characteristic bill, which in this genus is slender, strong and pointed.

The largest species with which we are acquainted is the *Foolish Guillemot*, which weighs about twenty-four ounces, and is seventeen inches in length. The bill is black, and









1. *Little Auk.*—2. *Red Throated Diver.*
3. *Striated Tern.*—4. *Great Tern.*

three inches in length. The head, neck, back, wings and tail are of a deep mouse colour; the tips of the lesser quill feathers, and all the under parts of the plumage are white. They accompany the ank in its visits to our shores, and are such foolish birds, that they will not quit the rock, though they see their companions killed around them.

The *lesser guillemot* weighs about fifteen ounces. The upper parts of its plumage are darker than in the former species. The *black guillemot* is entirely black, except a large mark of white on the wings. In winter, however, this bird is said to change to white; and there is a variety in Scotland not uncommon, which is spotted, and which Mr. Edwards has described under the name of the spotted Greenland dove. The *marbled guillemot*, which is found at Kamschatka, &c. receives its name from its plumage, which is dusky, elegantly marbled with white.

THE DIVER genus includes about seven species foreign and domestic. The great *northern diver* weighs sixteen pounds, and measures three feet six inches in length. The bill is strong, black, and above four inches in length. The head and neck are velvet-black, with a white crescent immediately under the throat, and another behind. The upper parts of the plumage are also black, spotted with white, and the breast and belly perfectly white. This bird is found in all the northern parts of Europe, and feeds on fish. It flies high and well. The *Imber* is less than the preceding, but still larger than a goose. The upper parts of the plumage are in general dusky; the under parts silvery white. It is very common in the Orknies. The skins of both these species are so remarkably tough, that in some of the northern countries they have been used as leather.

The *speckled diver* is more common in the southern parts of Europe. It is called on the Thames the *sprat loon*. It weighs about two pounds and a half; and has the upper parts of the body dusky spotted with white, the breast and belly white. It is so confident of its skill in diving, that it often approaches very near the boats when fishing for sprats or herrings. The *black throated diver* has the fore part of the throat black, the back and wings of the same colour spotted with white; the head and neck ash-colour, and the breast and belly white. This bird is common in the northern regions, but seldom found in France or England.

The *red-throated diver* differs chiefly from the preceding in having the throat and part of the neck of a fine red; the up-

per parts of the body also are dusky, marked with a few whit spots. It is seldom found to the south of Scotland.

Of the foreign birds of this species, the *Chinese Diver* is the only animal worth notice. The upper parts of the plumage are of a greenish brown; the under parts a reddish white, marked with dark spots. This is generally supposed to be one of the birds which the Chinese train up for the purpose of fishing, of which we shall have occasion to treat further when we speak of the corvorant.

Of the TERN there are about twenty-three different species, which are all distinguished by one common characteristic, viz. the forked tail.

The *great tern* is about fourteen inches long, and weighs four ounces and a quarter. The bill and feet are a fine crimson, the former is tipt with black, and very slender. The back of the head is black; the upper part of the body a pale grey, and the under part white. These birds have been called sea swallows, as they appear to have all the same actions at sea that the swallow has at land, seizing every insect which appears on the surface, and darting down upon the smaller fishes, which they seize with incredible rapidity.

The *lesser tern* weighs only two ounces five grains. The bill is yellow, and from the eyes to the bill is a black line. In other respects it almost exactly resembles the preceding.

The *black tern* is of a middle size between the two preceding species. It weighs two ounces and a half. It receives its name from being all black as far as the vent, except a spot of white under the throat. This bird is called about Cambridge the *car swallow*. It is a very noisy animal.

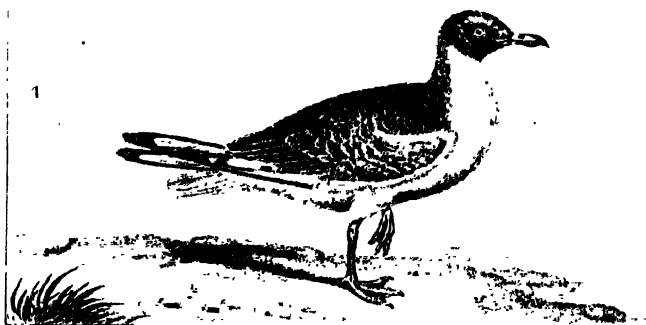
Among the foreign birds of the tern genus, there are some found of a snowy white; but the most singular bird of this kind is the *striated tern* which is found at New Zealand. It is thirteen inches in length. The bill is black, and the body in general mottled, or rather striped with black and white. The *noddy* is about fifteen inches long. The bill is black, and two inches long, and the whole plumage a sooty brown, except the top of the head, which is white. It is a very common bird in the tropical seas, where it is known frequently to fly on board ships, and is taken with the hand. But though it be thus stupid, it bites the fingers severely, so as to make it unsafe to hold it. It is said to breed in the Bahama islands.

The whole genus of PETRELS are known by having instead of a back toe only a sharp spur or nail; they have also a fa-









1. Stormy Petrel. 2. Kittiwake Gull.
3. Common Gull. 4. Pewit Gull.

culty of spouting from their bills, to a considerable distance, a large quantity of pure oil, which they do by way of defence, into the face of any person who attempts to take them.

The *fulmar* is the largest of the kind which is known in these climates. It is superior to the size of the common gull, being about fifteen inches in length, and in weight seventeen ounces. The bill is very strong, yellow, and hooked at the end. The head, neck, and all the under parts of the body are white; the back and wings ash-coloured, the quills dusky, and the tail white. It feeds on the blubber of whales, which supplies the reservoir, whence it spouts, with a constant stock of ammunition. This oil is esteemed by the inhabitants of the North as a sovereign remedy in many complaints both external and internal. The flesh is also considered by them as a delicacy, and the bird is therefore in great request at St. Kilda. It is said, that when a whale is taken, these birds will, in defiance of all endeavours, light upon it, and pick out large lumps of fat even while it is alive.

The *shearwater*, or *manks puffin*, as it is called by Willoughby, is something smaller than the preceding. The head, and all the upper part of the body, are of a sooty blackness; and the under part and inner coverts of the wings white. These birds are found in the Calf of Man, and the Scilly Isles. In February they take a short possession of the rabbit burrows, and then disappear till April; they lay one egg, and in a short time the young are fit to be taken. They are then salted and barrelled. During the day they keep at sea fishing, and towards evening return to their young, whom they feed by discharging the contents of the stomach into their mouths.

The *stormy petrel* is about the size of a house swallow. The general colour of the plumage is black, except about the rump, which is white. They sometimes hover over the water like swallows, and sometimes appear to run on the top of it: they are also excellent divers. They are very clamorous, and are called by the sailors *Mother Cary's chickens*, who observe that they never settle or sit upon the water, but when stormy weather is to be expected. They are found in most parts of the world; and in the Farro islands the inhabitants draw a wick through the body of the bird, from the mouth to the rump, which serves them as a candle, being fed by the vast proportion of oil which this little animal contains.

There are about twenty species of foreign birds of this kind. In the high southern latitudes one is found, which is the size of a goose, and on that account called the *giant pe-*

trel. The upper parts of its plumage are pale brown, mottled with dusky white; the under parts are white.

The Gull, and all its varieties, is well known to most readers. It is seen with slow-sailing flight hovering over rivers, to prey upon the smaller kinds of fish; it is seen following the plowman in fallow fields to pick up insects; and when living animal food is not to be found, it has even been known to eat carrion, and whatever else offers of the kind.

Of the gull there are about nineteen species. The largest with which we are acquainted is the *black backed gull*, so called, because the upper part of the back and wings are black, the rest of the body being a perfect white. It weighs near five pounds, is twenty-nine inches in length, and in the extent of its wings five feet nine inches. It is common in England, and in all the north of Europe. In America it is called the *old wife*.

The *skua gull* is the size of a raven. The upper parts of the head, neck, back, and wings are deep brown; the under parts a pale rusty ash colour. The legs are black, rough, and warty, and the talons very strong and hooked. It is mostly a native of the North, though often found in England. It is a most formidable bird, as it not only preys upon fish, but upon all the smaller water-fowl, and even on young lambs. It has the fierceness of the eagle in defending its young; and when the inhabitants of the Farro isles attack its nest, they hold a knife over their heads, on which the skua will transfix itself in its fall on the invaders. On the rocky island of Foula, one of the Shetland isles, it is a privileged bird, as it is said to defend the flocks from the eagle, which it pursues and beats off with great fury whenever he persumes to visit the island.

The *wagel gull* has its whole plumage composed of a mixed brown ash colour and white. It weighs about three pounds.

The *herring-gull* resembles the *black-backed* in every thing but size, and that the plumage on the back and wings is more inclined to ash colour than black; it weighs thirty ounces. The *glacous gull*, which inhabits Norway, &c. is rather larger than the herring gull, but resembles it in most other respects; the *silvery gull* is the same size as the herring gull, and not much different in plumage and manners.

The *tarrack*, and the *kittiwake gulls* also so nearly resemble each other, that some authors affirm the latter to be only the tarrack in a state of perfection. The head, neck, belly, and tail of the kittiwake are of a snowy whiteness, the back and

wings are grey; and both species have behind each ear a dark spot; both species are about the same size, viz. fourteen inches, and the tarrack weighs seven ounces. Of the *arctic gull* the male has the top of the head black; the back, wings, and tail dusky; the rest of the body white: the female is entirely brown. It has been called the parasite, from its habits of pursuing the lesser gulls till they drop their ordure through fear, which this filthy animal catches and devours, before it drops into the water.

The *common gull* is seventeen inches long, and weighs one pound. The bill is yellow; the back and wings a pale grey, and the head and rest of the body white. The *winter gull* is also very common in all these parts of Europe. The top of the head is white, marked with oblong dusky spots; the back and wings ash-colour, marked with dusky brown.

The jelly-like substance known by the name of star-shot, or star-jelly, owes its origin to some of these birds, being nothing but the half-digested remains of earth-worms, on which they feed, and often discharge from their stomachs.

The *pewit-gull*, or *black-cap*, is so called from the head and throat being of a dark or black colour. The *red-legged gull*, the *brown-headed-gull*, the *laughing gull*, which only differs from the others in having the legs black instead of red are possibly only varieties of the same species. They are in length from fifteen to eighteen inches. The back and wings of these birds are in general ash-colour, and the rest of the body white. The young birds of these species are thought by some to be good eating.

The *guat gull*, which is found on the borders of the Caspian sea, though distinguished by a black head, is quite a different species from our black cap, as it equals in size the Barnacle goose, and weighs between two and three pounds: its voice too is as hoarse as that of a raven.

The gull genus, like all other rapacious birds, lay but few eggs; and hence, in many places, their number is daily seen to diminish. Most of the kind are fishy tasted, with black stringy flesh; and of these, the poor inhabitants of our northern islands make their wretched banquets. They have been long used to no other food; and even salted gull can be relished by those who know no better.

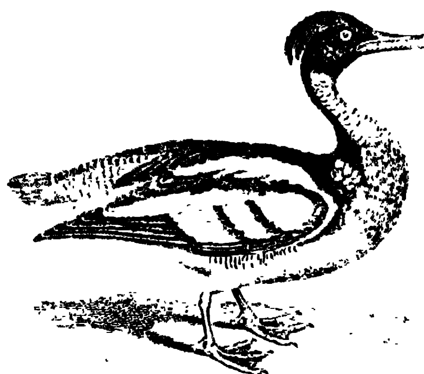
The gull, the petrel, the tern, have all nearly the same habits, the same nature, and are caught in the same manner, that is, at the most imminent risk, and with the loss of many lives in the course of a season.

But of this dangerous sport, a more particular description will perhaps be acceptable to the reader. Those who have been upon our coasts know, that there are two different kinds

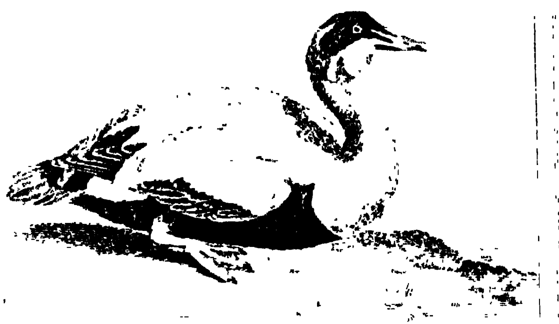
of shores; that which slopes towards the water with a gentle declivity, and that which rises with a precipitate boldness, and appears as a bulwark to repel the force of the invading deep. It is to such shores as these that the vast variety of sea-fowl resort, and in the cavities of these rocks they breed in safety. Of the tremendous sublimity of these elevations, it is not easy to form an idea. The boasted works of art, the highest towers, the noblest domes, are but ant-hills, when put in comparison; the single cavity of a rock often exhibits a coping higher than the ceiling of a Gothic cathedral. What should we think of a precipice three quarters of a mile in height? and yet the rocks of St. Kilda are still higher! What must be our awe to approach the edge of that impending height, and to look down on the unfathomable vacuity below? To ponder on the terrors of falling to the bottom, where the waves that swell like mountains are scarcely seen to curl on the surface, and the roar of the ocean appears softer than the murmur of a brook! It is in these formidable mansions that myriads of sea fowls are ever seen sporting. To the spectator from above, those birds, though some of them above the size of an eagle, seem scarcely as large as a swallow: and their loudest screaming is scarce percéptible.

Yet even here these animals are not in perfect security from the arts and activity of man. Want, which is the great spring of human exertion, can force the cottager to tempt the most formidable dangers, and to put forth an endeavour almost beyond the force of man. When the precipice is to be assailed from below, the fowlers furnish themselves with poles of five or six ells in length, with a hook at the end, and fixing one of these poles in the girdle of the person who is to ascend, his companions, in a boat, or on a projection of the cliff, assist his progress till he procures a firm footing. When this is accomplished, he draws the others up with a rope, and another man is forwarded again by means of the pole to a higher station. Frequently the person who is in the highest situation holds another man suspended by a rope, and directs his course to the place where the birds have placed their nests. It unfortunately too often happens, that the man who holds the rope has not a footing sufficiently secure, and in that case both of them inevitably perish.

Some precipices are so abrupt, that they are not by any means to be ascended from below. In this case a rope is provided of eighty or a hundred fathoms long, which one of the fowlers fastens to his waist, and between his legs, in such a manner as to support him in a sitting posture. The rope is held by five or six persons on the top, and it slides upon a







1. Red breasted Merganser. 2. Smew. 3. Eider Duck

piece of wood, which is laid so as to project beyond the precipice. By means of this apparatus, the man is gradually let down, and he attacks the habitations of the feathered race, with the most sanguinary success. This operation is however not without its dangers. By the descent and friction of the rope the loose stones are furiously hurled down on every side. To defend himself from their blows, the fowler covers his head with a kind of helmet, or with a seaman's shaggy cap. Many however loose their lives by this kind of accident. Those who are unskilful, frequently suffer by a giddiness with which they are seized on beholding themselves suspended from this tremendous height: he, on the other hand, who is accustomed to the sport, swings himself about with amazing dexterity; he directs his attack to that part of the rock which promises the amplest success; with his fowling staff he strikes the game as it proceeds out of the holes; he occasionally disengages himself from the rope by which he was suspended; he roams through the cavities of the rock, and when he has provided himself with a sufficient booty, he gives the signal to his companions, and is again drawn up, when the festivity of the evening, among these poor and desperate adventurers, generally compensates for the fatigues and dangers of the day.

The Merganser genus includes only about six species, in all of which the bill is slender, and furnished at the end with a crooked nail, and grated or toothed both upper and under chap like a saw. The largest of the kind is the *gooseander*, which weighs about four pounds. The bill is red; the head very full of feathers on the top and back part. The plumage is various and beautiful. The head and upper parts are fine glossy black, the rump and tail ash colour, and the under parts of the neck and body a fine pale yellow. Its manners and appetites entirely resemble those of the diver. It feeds upon fish, for which it dives; it is said to build its nest upon trees, like the heron and the corvorant.

The *dun diver* is less than the gooseander. The upper part of the head is reddish brown; the back and wings ash-colour, and the lower parts of the body white. It is found in the same places, and has the same manners with the gooseander. The *Red-breasted Merganser* is still smaller, weighing only two pounds. The head and neck are black, glossed with green, the rest of the neck and the belly white; the upper part of the back is glossy black; the lower parts and the rump are striated with brown and pale grey; on the wings there are white bars tipped with black, and the breast is

reddish, mixed with black and white. The plumage of the female is less splendid; and they differ in another respect, viz. that the male has a very full and large crest, the female only the rudiment of one.

The *smew* is rather larger than the teal, and is in general white, with some black marks; it is also crested.

The *minute merganser* is still less than the smew. The head is slightly crested, and of a rust colour; the back and tail are of a dusky ash-colour; the breast mottled, and the belly white.

The *hooded merganser* is a native of North America. It is about the size of a wigeon. The head and neck are dark brown, the former surrounded with a large round crest, the midle of which is white. The back and quills are black, the tail dusky; and the breast and belly white, undulated with black. The female is fainter in the colour of her plumage, and has a smaller crest.

The Duck genus embraces one hundred species, infinitely differing in size and plumage; many of them are rendered domestic, but a still greater proportion are in their native untamed state. All the species are distinguished by their strong flat bill, furnished at the end with an additional piece, termed a nail, and marked at the edges with lamellæ, or teeth.

Though these birds do not reject animal food when offered them, yet they can contentedly subsist upon vegetables, and seldom seek any other. They are easily provided for; wherever there is water there seems to be plenty. All the other web-footed tribes are continually voracious, continually preying. These lead more harmless lives: the weeds on the surface of the water, or the insects at the bottom, the grass by the bank, or the fruits and corn in cultivated grounds, are sufficient to satisfy their easy appetites.

They breed in great abundance, and lead their young to the pool the instant they are excluded.

As their food is simple, so their flesh is nourishing and wholesome. The swan was considered as a high delicacy among the ancients; the goose was abstained from as totally indigestible. Modern manners have inverted tastes; the goose is now become the favourite; and the swan is seldom brought to table, unless for the purpose of ostentation. But at all times the flesh of the duck was in high esteem; the ancients thought even more highly of it than we do. We are contented to eat it as a delicacy; they also considered it as a medicine: and Plutarch assures us, that Cato kept his



Pintail. 2. Mute Swan. 3. Pelican

whole family in health, by feeding them with duck whenever they threatened to be out of order.

No bird makes a more indifferent figure upon land, or a more beautiful one in the water, than the *swan*. This fine bird has long been rendered domestic. The wild or *whistling swan*, though so strongly resembling this in colour and form, is yet a different bird; for it is very differently formed within. The wild swan is less than the tame almost a fourth; for as the one weighs twenty pounds, the other only weighs sixteen pounds and three quarters. The colour of the tame swan is all over white; that of the wild bird is along the back and the tips of the wings, of ash-colour; the tame swan is mute, the wild one has a sharp loud cry, particularly while flying. But these are slight differences, compared to what are found upon dissection. The wild species is found in most of the northern regions, in America, and probably in the East Indies.

This *mute*, or *tame swan* is as delicate in its appetites, as it is elegant in its form. Its chief food is corn, bread, herbs growing in the water, and roots and seeds, which are found near the margin. It prepares a nest in some retired part of the bank, and chiefly where there is an islet in the stream. It is composed of water-plants, long grass, and sticks. The swan lays seven or eight eggs, white, much larger than those of a goose, with a hard shell. It sits near two months before its young are excluded; which are ash-coloured when they first leave the shell, and for some months after.

All the stages of this bird's approach to maturity are slow, and seem to mark its longevity. It is two months hatching; a year in growing to its proper size. The swan is said to be remarkable for its longevity. A goose has been known to live an hundred years; and the swan, from its superior size, and from its harder, firmer flesh, may naturally be supposed to live still longer.

The *goose*, in its domestic state, exhibits a variety of colours. The *wild goose*, or *grey lag*, always retains the same marks: the whole upper part is ash-coloured; the breast and belly are of a dirty white; the bill is narrow at the base, and at the tip it is black; the legs are of a saffron colour, and the claws black. It frequently weighs about ten pounds.

The wild goose is supposed to breed in the northern parts of Europe; and, in the beginning of winter, to descend into more temperate regions. If they come to the ground by day, they range themselves in a line, like cranes; and seem rather to have descended for rest, than for other refreshment. When they have sat in this manner for an hour or two, we have heard one of them, with a loud long note, sound a kind

of charge, to which the rest punctually attended, and they pursued their journey with renewed alacrity. Their flight is very regularly arranged; they either go in a line a-breast, or in two lines, joining in an angle in the middle.

The *bean goose* is a bird of passage, and arrives in Lincolnshire about autumn, and departs in May. It weighs about six pounds. The bill is smaller than in the preceding species. The head and neck are brown, the back and wings ash-colour, and the breast and belly dirty white. It feeds much on the young corn, beans, &c. whence its name.

The *barnacle* differs in some respects from all these; being less than any of them, with a black bill, much shorter than any of the preceding. It is scarcely necessary to combat the idle error of this bird's being bred from the shell sticking to ship's bottoms; it is well known to be hatched from an egg, in the ordinary manner, and to differ in very few particulars from all the rest of its kind The upper parts of the plumage are black, the forehead, chin, and all the under parts white.

The *brent goose* is still less than the former, and not bigger than a Muscovy duck, except that the body is longer. The head, neck, and upper part of the breast, are black; about the middle of the neck, on each side, are two small spots, or lines of white, which together appear like a ring. Both this and the preceding frequent our coasts in winter; and in some seasons have been so numerous, on the coasts of Picardy, as to become a pest to the inhabitants.

The *tame duck* is the most easily reared of all our domestic animals. The *wild duck*, or *mallard*, differs, in many respects, from the tame; and in them there is a still greater variety than among the domestic kinds.

The most obvious distinction between wild and tame ducks is in the colour of their feet; those of the tame duck being black; those of the wild duck yellow. The difference between wild ducks among each other, arises as well from their size, as the nature of the place they feed in. Sea-ducks, which feed in the salt-water, and dive much, have a broad bill, bending upwards, a large hind toe, and a long blunt tail. Pond-ducks, which feed in plashes, have a straight and narrow bill, a small hind toe, and a sharp pointed train. The former are called, by our decoy-men, foreign ducks; the latter are supposed to be natives of England. In this tribe, we may rank, as natives of Europe, the *Eider Duck*, which is double the size of a common duck, with a black bill; and the male of which is wholly white, except the crown of the head, the coverts of the wings, the belly, and tail, which are black; the *Velvet Duck*, not so large, and with a yellow bill; the *Scoter*

Duck, or *Black Diver*, with a knob at the base of a yellow bill; the *Tufted Duck*, adorned with a thick crest; the *Scaup Duck*, less than the common duck, with the bill of a greyish blue colour; the *Golden Eye*, with a large white spot at the corners of the mouth, resembling an eye; the *Sheldrake*, with the bill of a bright red, and swelling into a knob; the *Mallard*, which is the stock whence our tame breed has probably been produced; the *shoveller*, which has a bill three inches long, and remarkably broad at the end; the *Pintail*, with the two middle feathers of the tail three inches longer than the rest; the *Pochard*, with the head and neck of a bright bay; the *long-tailed duck*, the general colour of whose plumage is deep chocolate, and the outer feathers of the tail, which are white, four inches longer than the rest; the *widgeon*, with a lead-coloured bill, and the plumage of the back marked with narrow black and white undulated lines, but best known by its whistling sound: lastly, the *Teal*, which is the smallest of this kind, with the bill black, the head and upper part of the neck of a bright bay. These are the most common birds of the duck kind among ourselves; but who can describe the amazing variety of this tribe, if he extends his view to the different quarters of the world? The most noted of the foreign tribe are, the *Muscovy Duck*, or, more properly speaking, the Musk Duck, so called from a supposed musky smell, with naked skin round the eyes, and which is a native of Africa. The *Brasilian Duck*, which is of the size of a goose, all over black except the tips of the wings. The *American Wood Duck*, with a variety of beautiful colours, and a plume of feathers, which falls from the back of the head like a friar's cowl.

The *Chinese*, or *Mandarin Duck*, is somewhat less than a wigeon, but remarkable for its elegance and beauty. The prevailing colour of its plumage on the upper parts is dusky brown; the scapulars, however, are black, and at the bend of the wing are three transverse streaks of black, and two of white alternately. The neck and breast are chesnut; the beak and legs are red, and the head is adorned with a fine expanded crest, the base of which is white, and the upper part a beautiful glossy green.

These, and many others, might be added, were increasing the number of names the way to enlarge the sphere of our comprehension.

All these live in the manner of our domestic ducks, keeping together in flocks in the winter, and flying in pairs in summer; bringing up their young by the water-side, and leading them to their food as soon as out of the shell. Their nests

are usually built among heath or rushes, not far from the water; and they lay twelve, fourteen, or more eggs before they sit; yet this is not always their method; the dangers they continually encounter from their situation, sometimes oblige them to change their manner of building; and their awkward nests are often seen exalted on the tops of trees. This must be a very great labour to perform, as the duck's bill is but ill-formed for building a nest, and giving the materials of which it is composed a sufficient stability to stand the weather. The nest, whether high or low, is generally composed of the longest grass, mixed with heath, and is lined within with the bird's own feathers. The *eider duck* is particularly remarkable for the warmth of its nest. This bird, which, as was said, is above twice as large as the common duck, and resides in the colder climates, lays from six to eight eggs, making her nest among the rocks or the plants along the sea-shore. The external materials of the nest are such as are in common with the rest of the kind; but the inside lining, on which the eggs are immediately deposited, is at once the softest, warmest, and the lightest substance with which we are acquainted. This is no other than the inside down which covers the breast of the bird in the breeding season. This the female plucks off with her bill, in order to line the inside of her nest. The natives watch the place where she begins to build, and, suffering her to lay, take away both the eggs and the nest. The duck, however, not discouraged by the first disappointment, builds and lays in the same place a second time, and this they in the same manner take away: the third time she builds, but the drake must supply the down from his breast to line the nest with: and, if this be robbed, they both forsake the place, and breed there no more. This down the natives take care to separate from the dirt and moss with which it is mixed: and, though no people stand in more need of a warm covering than themselves, yet their necessities compel them to sell it to the more indolent and luxurious inhabitants of the south, for brandy and tobacco.

As these animals possess the faculties of flying and swimming, so they are in general birds of passage, and it is most probable perform their journeys across the ocean as well on the water as in the air. Those that migrate to this country, on the approach of winter, are seldom found so well tasted or so fat as the fowls that continue with us the year round: their flesh is often lean, and still oftener fishy; which flavour it has probably contracted in the journey, as their food in the lakes of Lapland, whence they descend, is generally of the insect kind.

As soon as they arrive among us, they are generally seen flying in flocks, to make a survey of those lakes where they intend to take up their residence for the winter. Lakes, with a marsh on one side, and a wood on the other, are seldom without vast quantities of wild fowl. The greatest quantities are taken in decoys; which, though well known near London, are yet untried in the remoter parts of the country. The manner of making and managing a decoy is as follows:

A place is to be chosen for this purpose far remote from the common highway, and all noise of people. When the place is chosen, the pool, if possible, is to be planted round with willows, unless a wood answers the purpose of shading it on every side. On the south and north side of this pool are two, three, or four ditches or channels, made broad towards the pool, and growing narrower till they end in a point. These channels are to be covered over with nets supported by hooped sticks bending from one side to the other; so that they form a vault or arch growing narrower and narrower to the point, where it is terminated by a tunnel-net, like that in which fish are caught in wears. Along the banks of these channels so netted over, which are called pipes, many hedges are made of reeds slanting to the edge of the channel, the acute angles to the side next the pool. The whole apparatus also is to be hidden from the pool by a hedge of reeds along the margin, behind which the fowler manages his operations. The place being fitted in this manner, the fowler is to provide himself with a number of wild ducks made tame, which are called decoys. These are always to be fed at the mouth or entrance of the pipe, and to be accustomed to come at a whistle.

As soon as the evening is set in, the *decoy rises*, as they term it, and the wild fowl feed during the night. If the evening be still, the noise of their wings, during their flight, is heard at a very great distance, and produces no unpleasing sensation. The fowler, when he finds a fit opportunity, and sees his decoy covered with fowl, walks about the pool, and observes into what pipe the birds gathered in the pool may be enticed or driven. Then casting hemp-seed, or some such seed as will float on the surface of the water, at the entrance and up along the pipe, he whistles to his decoy ducks, who instantly obey the summons, and come to the entrance of the pipe, in hopes of being fed as usual. Thither also they are followed by a whole flock of wild ones, who little suspect the danger preparing against them. The wild ducks, therefore, pursuing the decoy ducks, are led into the broad mouth of the channel or pipe, nor have the least suspicion of the man,

who keeps hidden behind one of the hedges. When they have got up the pipe, however, finding it grow more and more narrow, they begin to suspect danger, and would return back; but they are now prevented by the man, who shews himself at the broad end below. Thither, therefore, they dare not return; and rise they may not, as they are kept by the net above from ascending. The only way left them, therefore, is the narrow-funneled net at the bottom; into this they fly, and there they are taken.

It often happens, however, that the wild fowl are in such a state of sleepiness or dozing, that they will not follow the decoy ducks. Use is then generally made of a dog who is taught his lesson. He passes backward and forward between the reed-hedges, in which there are little holes, both for the decoy man to see, and for the little dog to pass through. This attracts the eye of the wild fowl; who, prompted by curiosity, advance towards this little animal, while he all the time keeps playing among the reeds, nearer and nearer the funnel, till they follow him too far to recede. Sometimes the dog will not attract their attention till a red handkerchief, or something very singular, be put about him. The decoy ducks never enter the funnel-net with the rest, being taught to dive under water as soon as the rest are driven in.

To this manner of taking wild fowl in England, we will subjoin another still more extraordinary, frequently practised in China. Whenever the fowler sees a number of ducks settled in any particular plash of water, he sends off two or three gourds to float among them. These gourds resemble our pompions; but, being made hollow, they swim on the surface of the water; and on one pool there may sometimes be seen twenty or thirty of these gourds floating together. The fowl at first are a little shy at coming near them; but by degrees they come nearer; and as all birds at last grow familiar with a scare-crow, the ducks gather about these, and amuse themselves by whetting their bills against them. When the birds are as familiar with the gourds as the fowler could wish, he then prepares to deceive them in good earnest. He hollows out one of these gourds large enough to put his head in; and, making holes to breathe and see through, he claps it on his head. Thus accoutred, he wades slowly into the water, keeping his body under, and nothing but his head in the gourd above the surface; and in that manner moves imperceptibly towards the fowls, who suspect no danger. At last, however, he fairly gets in among them; while they, having been long used to see gourds, take not the least fright while the enemy is in the very midst of them; and an insidious ene-

enemy he is; for ever as he approaches a fowl, he seizes it by the legs, and draws it in a jerk under water. There he fastens it under his girdle, and goes to the next, till he has thus loaded himself with as many as he can carry away. When he has got this quantity, without ever attempting to disturb the rest of the fowls on the pool, he slowly moves off again; and, in this manner, pays the flock three or four visits in a day. Of all the various artifices for catching fowl, this seems likely to be attended with the greatest success, and is the most practised in China.

The PELICAN is properly a foreign bird, but as the genus includes some species which are found in our European climates, we have introduced it between the domestic and foreign animals of this order. The distinguishing characters of this genus is a naked gullet, and capable of great distention.

The *great white Pelican* of *Africa* is much larger than a swan, and somewhat of the same shape and colour. Its four toes are all webbed together; and its neck, in some measure, resembles that of a swan: but that singularity in which it differs from all other birds, is in the bill, and the great pouch underneath, which are wonderful, and demand a distinct description. This enormous bill is fifteen inches from the point to the opening of the mouth, which is a good way back behind the eyes. The base of the bill is somewhat greenish: but it varies towards the end, being of a reddish blue. To the lower edges of the under-chap, hangs a bag, reaching the whole length of the bill to the neck, which is said to be capable of containing fifteen quarts of water. This bag the bird has a power of wrinkling up into the hollow of the under-chap; but, by opening the bill, and putting one's hand down into the bag, it may be distended at pleasure. It is not covered with feathers, but a short downy substance, as smooth and as soft as satin. Tertre affirms, that this pouch will hold as many fish as will serve sixty hungry men for a meal. Such is the formation of this extraordinary bird, which is a native of Africa and America. It was once also known in Europe, particularly in Russia; but it seems to have deserted our coasts.

In the island of Manilla the pelicans are of a rose colour, and in America they are brown. They are all torpid and inactive to the last degree, so that nothing can exceed their indolence but their gluttony. It is only from the stimulations of hunger that they are excited to labour; for otherwise they would continue always in fixed repose. When

they have raised themselves about thirty or forty feet above the surface of the sea, they turn their head, with one eye downwards, and continue to fly in that posture. As soon as they perceive a fish sufficiently near the surface, they dart down upon it with the swiftness of an arrow, seize it with unerring certainty, and store it up in their pouch. They then rise again, though not without great labour, and continue hovering and fishing, with their head on one side, as before.

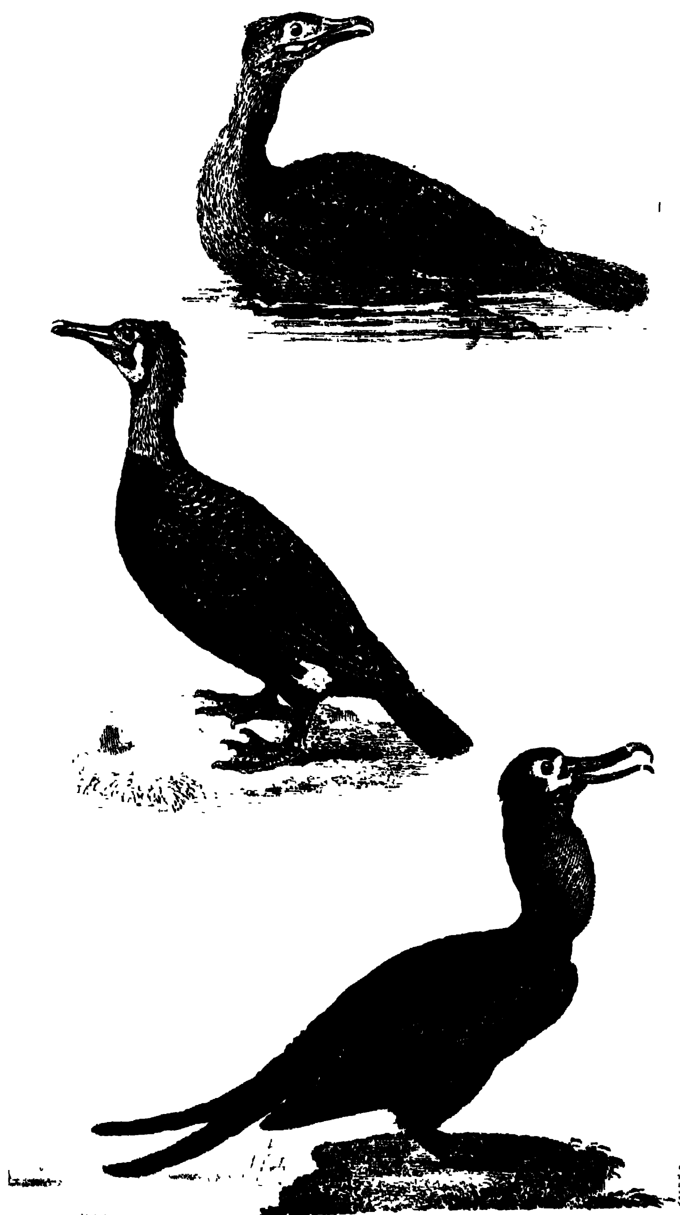
This work they continue, with great effort and industry, till their bag is full: and then fly to land, to devour and digest, at leisure, the fruits of their industry. This, however, it would appear, they are not long performing; for, towards night, they have another hungry call; and they again, reluctantly, go to labour. Their life is spent between sleeping and eating; and they are as foul as they are voracious, as they are, every moment, voiding excrements in heaps, as large as one's fist. The female makes no preparation for her nest, nor seems to choose any place in preference to lay in, but drops her eggs on the bare ground, to the number of five or six, and there continues to hatch them. The flesh is not fit to eat.

With all the seeming indolence of this bird, it is not entirely incapable of instruction in a domestic state. Father Raymond assures us, that he has seen one so tame and well educated among the native Americans, that it would go off in the morning, at the word of command, and return before night to its master, with its great pouch distended with plunder; a part of which the savages would make it disgorge, and a part they would permit it to reserve for itself.

"The pelican," as Faber relates, "is not destitute of other qualifications. One which was brought alive to the Duke of Bavaria's court, whence it lived forty years, seemed to be possessed of very uncommon sensations. It was much delighted in the company and conversation of men, and in music, both vocal and instrumental; for it would willingly stand (says he) by those that sung or sounded the trumpet; and stretching out its head, and turning its ear to the music, listen very attentively to its harmony, though its own voice was little pleasanter than the braying of an ass."

Gessner tells us, that the emperor Maximilian had a tame pelican, which lived for above eighty years, and which always attended his army on their march.

The *Frigate Pelican*, or *Man-of-War-Bird*, is chiefly met with between the tropics. It is the size of a large fowl. The bill is slender, five inches long, from the base of which a dark



1. Shag. 2. Corvorant. 3. Frigate Pelican

reddish skin spreads on each side of the head, and a large bag hangs down the throat; the whole plumage is brownish black, the tail is long, and much forked. It is often found above a hundred and sometimes two hundred leagues from land, and sometimes settles on the masts of ships. Its amazing length of wing, which is not less than fourteen feet, enables it to take immense flights; and, when it is not successful in fishing, it attacks the gulls and other water fowl, and makes them disgorge the fish which they have taken.

The *Corvorant* is about the size of a large Muscovy duck, and may be distinguished by its four toes being united by membranes together; and by the middle toe being toothed or notched, like a saw, to assist it in holding its fishy prey. The head and neck of this bird are of a sooty blackness, and the body thick and heavy, more inclining in figure to that of the goose than the gull. As soon as the winter approaches, they are seen dispersed along the sea-shore, and ascending up the mouths of fresh-water rivers, carrying destruction to all the finny tribe. They are most remarkably voracious, and have a most sudden digestion. Their appetite is for ever craving, and never satisfied. This gnawing sensation may probably be increased by the great quantity of small worms that fill their intestines, and which their increasing gluttony contributes to engender.

This bird has the most rank and disagreeable smell, and is more fœtid than even carrion, when in its most healthful state. It is seen as well by land as sea; it fishes in fresh-water lakes, as well as in the depths of the ocean; it builds in the cliffs of rocks, as well as on trees; and preys not only in the day time, but by night.

Its indefatigable nature, and its great power in catching fish, were, probably, the motives that induced some nations to breed this bird up tame, for the purposes of fishing. The description of their manner of fishing is thus delivered by Faber.

"When they carry them out of the rooms where they are kept to the fish-pools, they hood-wink them, that they may not be frightened by the way. When they are come to the rivers, they take off their hoods; and having tied a leather thong round the lower part of their necks, that they may not swallow down the fish they catch, they throw them into the river. They presently dive under water; and there, for a long time, with wonderful swiftness, pursue the fish; and, when they have caught them, rise to the top of the water, and pressing the fish lightly with their bills, swallow them; till each bird hath, after this manner, devoured five or six

fishes. Then their keepers call them to the fist, to which they readily fly; and, one after another, vomit up all their fish, a little bruised with the first nip given in catching them. When they have done fishing, setting the birds on some high place, they loose the string from their necks, leaving the passage to the stomach free and open; and, for their reward, they throw them part of their prey; to each one or two fishes, which they will catch most dexterously as they are falling in the air."

At present, the corvorant is trained up in every part of China for the same purpose. "It is very pleasant to behold with what sagacity they portion out the lake or the canal where they are upon duty. When they have found their prey, they seize it with their beak by the middle, and carry it without fail to their master. When the fish is too large, they then give each other mutual assistance: one seizes it by the head, the other by the tail, and in this manner carry it to the boat together. They have always, while they fish, a string fastened round their throats, to prevent them from devouring their prey."

The *Shag*, which the French call the lesser corvorant, is another of the pelican genus. The *common shag* is in length two feet. The general colour of its plumage is black, the belly is dusky, and the head and neck glossed with green. Like the corvorant it builds in trees. The *crested shag* is somewhat less than the preceding, and is less common. The *violet*, and *red-faced shags*, are both natives of Kamschatka; and *spotted* and *carunculated shags* are found in New Zealand. Besides these, there are several other foreign species, particularly in Africa, where there are two kinds of shags not larger than a teal.

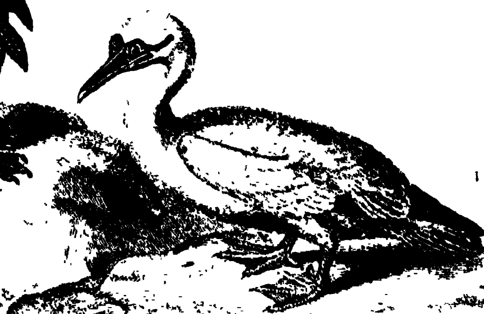
The *Gannet*, or *Soland Goose*, is of the size of a tame goose, but its wings much longer, being six feet over. The bill is six inches long, straight almost to the point. It differs from the corvorant in size, being larger; in its colour, which is chiefly white, and by its having no nostrils, but in their place a long furrow that reaches almost to the end of the bill. From the corner of the mouth is a narrow slip of black bare skin, that extends to the hind part of the head; beneath the skin is another that, like the pouch of the pelican, is dilatable, and of size sufficient to contain five or six entire herrings, which in the breeding season it carries at once to its mate or its young.

These birds, which subsist entirely upon fish, chiefly resort to those uninhabited islands where their food is found in plenty, and men seldom come to disturb them. The









1. *Yellow nosed Albatross.* 2. *Black bellied Darter*
3. *Patagonian Penguin.* 4. *Gannet.*

islands to the north of Scotland, the Skeling islands off the coasts of Kerry, in Ireland, and those that lie in the north sea off Norway abound with them. But it is on the Bass Island, in the Firth of Edinburgh, where they are seen in the greatest abundance. "It is scarcely possible to walk there without treading on them: the flocks of birds upon the wing are so numerous, as to darken the air like a cloud; and their noise is such, that one cannot, without difficulty, be heard by the person next to him."

The gannet is a bird of passage. In winter it seeks the more southern coasts of Cornwall, hovering over the shoals of herrings and pilchards that then come down from the northern seas: its first appearance in the northern islands is in the beginning of spring; and it continues to breed till the end of summer. But, in general, its motions are determined by the migrations of the immense shoals of herrings that come pouring down at that season, through the British Channel, and supply all Europe as well as this bird with their spoil. The gannet assiduously attends the shoal in their passage, keeps with them in their whole circuit round the island, and shares with the fishermen this exhaustless banquet. As it is strong of wing, it never comes near the land; but is constant to its prey. The young gannet is accounted a great dainty by the Scots, and sold very dear.

The *booby* is also a species of the pelican. The upper parts of the plumage are brown, the breast and belly white. It is found in several parts of America, and is described as a very simple bird.

The ALBATROSS is one of the largest and most formidable birds of Africa and America. The largest, which is called the *wandering albatross*, is rather larger than a swan; and its wings, when extended, ten feet from tip to tip. The bill, which is six inches long, is yellowish, and terminates in a crooked point. The top of the head is of a bright brown; the back is of a dirty, deep spotted brown; and the belly, and under the wings, is white. The toes, which are webbed, are of a flesh colour.

This bird is an inhabitant of the tropical climates, and also beyond them, as far as the Straits of Magellan, in the South Seas. It not only eats fish, but also such small water-fowl as it can take by surprise. It preys, as the gull kind do, upon the wing, and chiefly pursues the flying fish that are forced from the sea by the dolphins.

The albatross seems to have a peculiar affection for the penguin, and a pleasure in its society. They are always

seen to choose the same places of breeding; some distant, uninhabited island, where the ground slants to the sea, as the penguin is not formed either for flying or climbing. In such places their nests are seen together, as if they stood in need of mutual assistance and protection. In the middle on high, the albatross raises its nest, on heath, sticks and long grass, about two feet above the surface; and round this, the penguins make their lower settlements, rather in holes in the ground; and most usually eight penguins to one albatross.

There are about three other species of albatross, all of them smaller than the preceding. The upper parts of the plumage are a dusky blue black, and the rump and under parts white; but what peculiarly distinguishes it is, that the bill, which is four inches long, is black, all but the upper ridge, which is yellow quite to the tip. It inhabits the South Seas within the tropics.

The SKIMMER, or cutwater, is twenty inches in length, and in breadth three feet seven inches. The bill is of a very singular structure, the upper chap, or mandible, being above an inch shorter than the under, and the upper shuts into it, as a razor into its handle. The base of the bill is red, the rest black, and on the sides are several furrows. The forehead, chin, and all the under parts are white; the upper parts of the plumage black, with a bar of white across each wing. The tail is short and forked. It inhabits all America; is commonly on the wing, and skims along the surface to catch the small fish on which it feeds. It is frequently known by the name of the *razor-bill.*

The PENGUIN genus includes about nine species, which seem to hold the same place in the southern parts of the world, as the anks do in the North, neither of them having ever been observed within the tropics. The wings of the larger species do not enable them to rise out of the water, but serve them rather as paddles to help them forward, when they attempt to move swiftly; and in a manner walk along the surface of the water. Even the smaller kinds seldom fly by choice; they flutter their wings with the swiftest efforts without making way; and though they have but a small weight of body to sustain, yet they seldom venture to quit the water, where they are provided with food and protection.

As the wings of the penguin tribe are unfitted for flight, th' legs are still more awkwardly adapted for walking. This

whole tribe have all above the knee hid within the belly; and nothing appears but two short legs, or feet, as some would call them, that seem stuck under the rump, and upon which the animal is very awkwardly supported. They seem, when sitting or attempting to walk, like a dog that has been taught to sit up, or to move a minuet. Their short legs drive the body in progression from side to side; and, were they not assisted by their wings,. they could scarcely move faster than a tortoise.

This awkward position of the legs, which so unqualifies them for living upon land, adapts them admirably for a residence in water; in that, the legs placed behind the moving body, pushes it forward with greater velocity; and these birds, like Indian canoes, are the swiftest in the water, by having their paddles in the rear.

They are also covered more warmly all over the body with feathers, than any other birds whatever; so that the sea seems entirely their element.

The *Patagonian Penguin* weighs about forty pounds, and is four feet three inches in length. The bill measures four inches and a half, but is slender. The head, throat, and hind part of the neck are brown, the back of a deep ash colour, and all the under parts white. The *Magellanic penguin* is about the size of a goose; the upper parts of the plumage are black, and the under white. These birds walk erect with their heads on high, their fin-like wings hanging down like arms; so that to see them at a distance, they look like so many children with white aprons. Hence they are said to unite in themselves the qualities of men, fowls, and fishes. Like men they are upright; like fowls they are feathered; and like fishes, they have fin-like instruments, that beat the water before, and serve for all the purposes of swimming rather than flying.

There are *crested penguins* at Faukland's island, which are very beautiful birds; and there is a species at New Zealand not larger than a teal.

All the species feed upon fish; and seldom come ashore, except in the breeding season. Their flesh is rank and fishy; though our sailors say, that *it is pretty good eating*.

In some the flesh is so tough, and the feathers so thick, that they stand the blow of a scymitar without injury.

The penguin lays but one egg; and, in frequented shores, is found to burrow like a rabbit; sometimes three or four take possession of one hole, and hatch their young together. The egg of the penguin is very large for the size of the

bird, that of the smaller sorts being generally found bigger than that of a goose.

The TROPIC BIRD includes only three known species, which are all distinguished by a wedge-like tail, the two middle feathers extending a vast length beyond the others.

The *Common Tropic Bird* is about the size of a wigeon. The length to the tip of the two long feathers is nearly three feet. The bill is three inches long, and red. The head, neck, and under parts of the body are quite white. The upper parts of the plumage white also, but marked with black lines. The two middle feathers of the tail measure twenty inches, and project fifteen inches beyond the rest. It takes its name from being chiefly found within the tropics. It frequently flies very high, but generally attends upon the flying fishes in their escape from their watery enemies; and they have now and then been found in calm weather supinely floating on the backs of the drowsy tortoises. Their flesh is not good, but is sometimes eaten by the hungry sailors.

On the Palmerston island there is a *black-billed tropic bird;* and at Mauritius there is a tropic bird with a bill and a tail of a beautiful rose colour.

The DARTER is distinguished by a peculiarly long and slender neck, and includes three species.

The *white-bellied Darter* is scarcely so large as a mallard, but its neck is so long that it measures not less than two feet ten inches. The bill is three inches long, straight and pointed. The neck is covered with downy soft feathers, of a reddish grey; the upper parts of the plumage are dusky black, dashed with white: the under parts pure silvery white. It is a native of Brazil, and is extremely expert at catching fish.

The *black-bellied Darter* is the size of the common duck. The head, neck, and breast are light brown. The back, scapulars, &c. marked with stripes of black and white. The quill feathers, belly, thighs, and tail are deep black. The four toes are united like those of the corvorant. In the islands of Ceylon and Java it sits on the shrubs that hang over the water. In a country where people are so apprehensive of serpents, it often terrifies the passengers, by darting out its long and slender neck, which in their surprise they mistake for the attack of some fatal reptile.

CHAP. XXIX.

Of Fishes in general.—Of Cetaceous Fishes.—The Whale. —The Fin Fish.—The Narwhale, or Unicorn.—The Spermaceti Whale.—The Dolphin.—Grampus, Porpesse, &c.

THE number of fish to which we have given names, and with the figure of which at least we are a little acquainted, is, according to Linnæus, above four hundred. The majority of these are confined to the sea, and would expire in the fresh water, though there are a few which annually swim up the rivers, to deposit their spawn.

The chief instruments of a fish's motion are the fins, which in some fish are more numerous than in others. The fish, in a state of repose, spreads all its fins, and seems to rest upon its pectoral * and ventral † fins near the bottom: if the fish folds up, for it has the power of folding either of its pectoral fins, it inclines to the same side; folding the right pectoral fin, its body inclines to the right side; folding the left fin, it inclines to that side in turn. When the fish desires to have a retrograde motion, striking with the pectoral fins, in a contrary direction, effectually produces it. If the fish desires to turn, a blow from the tail sends it about; but if the tail strikes both ways, then the motion is progressive. In pursuance of these observations, if the dorsal ‡ and the ventral fins be cut off, the fish reels to the right and left, and endeavours to supply its loss by keeping the rest of its fins in constant employment. If the right pectoral fin be cut off, the fish leans to that side; if the ventral fin on the same side be cut away, then it loses its equilibrium entirely. When the tail is cut off, the fish loses all motion, and gives itself up to where the water impels it.

The senses of fishes are remarkably imperfect, and, indeed, that of sight is almost the only one which, in general, they may be truly said to possess. But this is, in some degree, compensated by their astonishing longevity, several species being known to live for more than an hundred years. Their longevity is still exceeded by their singular fecundity; for a single cod, for instance, produces at a birth as many young ones as there are inhabitants in all Great Britain, above nine millions. The flounder produces at once above a million, and the mackarel five hundred thousand.

* Those near the gills. † The belly fins. ‡ Back fins.

The spawn continues in its egg state in some fishes longer than in others, and this generally in proportion to their size The young of the salmon continues in egg from December to April; the carp three weeks, and the little gold-fish, from China is produced still quicker. The young spawn are the prey of all the inhabitants of the water, even of their own parents, and scarcely one in a thousand escapes the numerous perils of its youth.

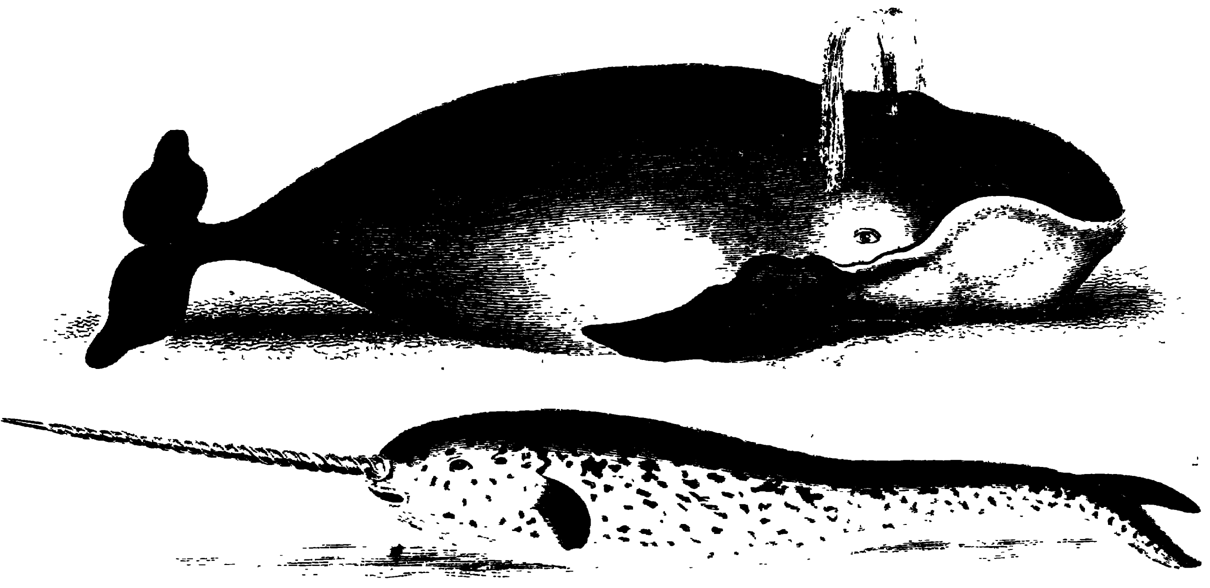
Such is the general picture of these heedless and hungry creatures; but there are some in this class, living in the waters, that are possessed of finer organs and higher sensations; that have all the tenderness of birds or quadrupeds for their young; that nurse them with constant care, and protect them from every injury. Of this class are the *Cetaceous* order, or the fishes of the whale kind. There are others, though not capable of nursing their young, yet that bring them alive into the world, and defend them with courage and activity. These are the *Cartilaginous* kinds, or those which have gristles instead of bones. But the fierce unmindful tribe we have been describing, that leave their spawn without any protection, are called the *Spinous* or bony kinds, from their bones resembling the sharpness of thorns.

Of Cetaceous Fishes.

THIS tribe is composed of the *Whale*, the *Cachalot*, the *Dolphin*, the *Grampus*, and the *Porpesse*. All these resemble quadrupeds in their internal structure, and in some of their appetites and affections. Like quadrupeds they have lungs, a midriff, a stomach, intestines, liver, spleen, bladder, and parts of generation; their heart also resembles that of quadrupeds, with its partitions closed up as in them, and driving red and warm blood in circulation through the body; and to keep these parts warm, the whole kind are also covered between the skin and the muscles with a thick coat of fat or blubber.

As these animals breathe the air, it is obvious that they cannot bear to be any long time under water. They are constrained, therefore, every two or three minutes, to come up to the surface to take breath, as well as to spout out through their nostril, for they have but one, that water which they sucked in while gaping for their prey.

But it is in the circumstances in which they continue their kind, that these animals shew an eminent superiority. Other



1. Common Whale. 2. Narwhal or Sea Unicorn

fish deposit their spawn, and leave their success to accident; these never produce above one young, or two at the most; and this the female suckles entirely in the manner of quadrupeds, her breasts being placed, as in the human kind, above the navel. Their tails also are different from those of all other fish: they are placed so as to lie flat on the surface of the water; while the other kinds have them, as we every day see, upright or edgeways. This flat position of the tail enables them to force themselves suddenly to the surface of the water to breathe, which they are continually constrained to do.

The WHALE. Of the whale, properly so called, there are no less than seven different kinds; all distinguished from each other by their external figure, or internal conformation. The *Great Greenland Whale*, without a back-fin, and black on the back; the *Iceland Whale*, without a back-fin, and whitish on the back; the *New England Whale*, with a hump on the back; the *Whale with six humps* on the back; the *Fin Fish*, with a fin on the back near the tail; the *Pike-headed Whale*, and the *Round-lipped Whale*. All these differ from each other in figure, as their names obviously imply. They differ also somewhat in their manner of living; the fin-fish having a larger swallow than the rest; being more active, slender, and fierce, and living chiefly upon herrings.

The *Great Greenland Whale* is the fish, for taking which there are such preparations made in different parts of Europe. It is a large heavy animal, and the head alone makes a third of its bulk. It is usually found from sixty to seventy feet long. The fins on each side are from five to eight feet, composed of bones and muscles, and sufficiently strong to give the great mass of body which they move, speed, and activity. Their tail is about twenty-four feet broad; and, when the fish lies on one side, its blow is tremendous. The skin is smooth and black, and, in some places, marbled with white and yellow; which, running over the surface, has a very beautiful effect.

The outward or scarf skin of the whale is no thicker than parchment; but this removed, the real skin appears of about an inch thick, and covering the fat or blubber that lies beneath: this is from eight to twelve inches in thickness; and is, when the fish is in health, of a beautiful yellow. The muscles lie beneath: and these, like the flesh of quadrupeds, are very red and tough.

The cleft of the mouth is above twenty feet long, which is near one third of the animal's whole length; and the upper jaw is furnished with barbs, that lie, like the pipes of

an organ, the greatest in the middle, and the smallest on the sides. These compose the whale-bone, the longest spars of which are found to be not less than eighteen feet. The tongue is almost immoveably fixed to the lower jaw, seeming one great lump of fat; and, in fact, it fills several hogsheads with blubber. The eyes are not larger than those of an ox; and when the crystalline humour is dried, it does not appear larger than a pea. They are placed towards the back of the head, being the most convenient situation for enabling them to see both before and behind; as also to see over them, where their food is principally found. They are guarded by eye-lids and eye-lashes, as in quadrupeds; and they seem to be very sharp-sighted.

Nor is their sense of hearing in less perfection; for they are warned, at great distances, of any danger preparing against them. We have already observed, that the substance, called whalebone, is taken from the upper jaw of the animal, and is very different from the real bones of the whale. The real bones are hard, like those of great land animals, are very porous, and filled with marrow. Two great strong bones sustain the under lip, lying against each other in the shape of an half-moon; some of these are twenty feet long; they are seen in several gardens set up against each other, and are usually mistaken for the ribs.

The fidelity of these animals to each other exceeds whatever we are told of even the constancy of birds. Some fishers, as Anderson informs us, having struck one of two whales, a male and a female, that were in company together, the wounded fish made a long and terrible resistance: it struck down a boat with three men in it, with a single blow of the tail, by which all went to the bottom. The other still attended its companion, and lent it every assistance; till, at last, the fish that was struck sunk under the number of its wounds; while its faithful associate, disdaining to survive the loss, with great bellowing, stretched itself upon the dead fish, and shared his fate.

The whale goes with young nine or ten months, and is then fatter than usual, particularly when near the time of bringing forth. The young ones continue at the breast for a year; during which time they are called by the sailors *short-heads.* They are then extremely fat, and yield above fifty barrels of blubber. The mother, at the same time, is equally lean and emaciated. At the age of two years they are called *stunts*, as they do not thrive much immediately after quitting the breast: they then yield scarce above twenty, or twenty-four barrels of blubber: from that time forward they are called *skull-fish*, and their age is wholly

unknown. The food of the whale is a small insect which is seen floating in those seas, and which Linnæus terms the Medusa. These insects are black, and of the size of a small bean, and are sometimes seen floating in clusters on the surface of the water. They are of a round form, like snails in a box, but they have wings, which are so tender that it is scarce possible to touch them without breaking. These, however, serve rather for swimming than flying. They have the taste of raw muscles, and have the smell of burnt sugar. Inoffensive as the whale is, it is not without enemies. There is a small animal, of the shell-fish kind, called the Whale-louse, that sticks to its body, as we see shells sticking to the foul bottom of a ship. This insinuates itself chiefly under the fins; and whatever efforts the great animal makes, it still keeps its hold, and lives upon the fat, which it is provided with instruments to arrive at.

The sword-fish, however, is the whale's most terrible enemy. "At the sight of this little animal," says Anderson, "the whale seems agitated in an extraordinary manner, leaping from the water as if with affright; wherever it appears, the whale perceives it at a distance, and flies from it in the opposite direction. I have been myself," continues he, "a spectator of their terrible encounter. The whale has no instrument of defence except the tail; with that it endeavours to strike the enemy; and a single blow taking place, would effectually destroy its adversary: but the sword-fish is as active as the other is strong, and easily avoids the stroke; then bounding into the air, it falls upon its enemy, and endeavours not to pierce with its pointed beak, but to cut with its toothed edges. The sea all about is soon dyed with blood, proceeding from the wounds of the whale; while the enormous animal vainly endeavours to reach its invader, and strikes with its tail against the surface of the water, making a report at each blow louder than the noise of a cannon."

There is still another and more powerful enemy called, by the fishermen of New England, the killer. This is itself supposed to be a cetaceous animal, armed with strong and powerful teeth. A number of these are said to surround the whale, in the same manner as dogs get round a bull. Some attack it with their teeth behind; others attempt it before: until, at last, the great animal is torn down, and its tongue is said to be the only part they devour when they have made it their prey. They are said to be of such great strength, that one of them alone was known to stop a dead whale that several boats were towing along, and drag it from among them to the bottom.

But of all the enemies of these enormous fishes, man is the greatest: he alone destroys more in a year than the rest in an age, and actually has thinned their numbers in that part of the world where they are chiefly sought. At the first discovery of Greenland, whales not being used to be disturbed, frequently came into the very bays, and were accordingly killed almost close to the shore; so that the blubber being cut off was immediately boiled into oil on the spot. The ships in those times took in nothing but the pure oil and the whale-bone, and all the business was executed in the country; by which means a ship could bring home the product of many more whales than she can according to the present method of conducting this trade. The fishery also was then so plentiful, that they were obliged sometimes to send other ships to fetch off the oil they had made, the quantity being more than the fishing ships could bring away. But time and change of circumstances have shifted the situation of this trade. The ships coming in such numbers from Holland, Denmark, Hamburgh, and other northern countries, all intruders upon the English, who were the first discoverers of Greenland, the whales were disturbed, and gradually, as other fish often do, forsaking the place, were not to be killed so near the shore as before; but are now found, and have been so ever since, in the openings and space among the ice, where they have deep water, and where they go sometimes a great many leagues from the shore.

The whale-fishery begins in May, and continues all June and July; but whether the ships have good or bad success, they must come away, and get clear of the ice, by the end of August; so that in the month of September at farthest they may be expected home; but a ship that meets with a fortunate and early fishery in May can return in June or July.

The manner of taking whales at present is as follows:— Every ship is provided with six boats, to each of which belong six men for rowing the boat, and an harpooner, whose business is to strike the whale with his harpoon. Two of these boats are kept constantly on the watch at some distance from the ship, fastened to pieces of ice, and are relieved by others every four hours. As soon as a whale is perceived, both the boats set out in pursuit of it, and if either of them can come up before the whale finally descends, which is known by his throwing up his tail, the harpooner discharges his harpoon at him. There is no difficulty in choosing the place where the whale is to be struck, as some have asserted; for these creatures only come up to the surface in order to spout up the water, or *blow*, as the fishermen term it, and therefore always keep the soft and vulnerable part of their bodies above

water.* As soon as the whale is struck, the men set up one of their oars in the middle of the boat as a signal to those in the ship. On perceiving this, the watchman alarms all the rest with the cry of *fall! fall!* upon which all the other boats are immediately sent out to the assistance of the first.

The whale, finding himself wounded, runs off with prodigious violence. Sometimes he descends perpendicularly; at others goes off horizontally, at a small depth below the surface. The rope which is fastened to the harpoon is about 200 fathoms long, and properly coiled up, that it may freely be given out as there is a demand for it. At first, the velocity with which this line runs over the side of the boat is so great, that it is wetted to prevent its taking fire: but in a short time the strength of the whale begins to fail, and the fishermen, instead of letting out more rope, strive as much as possible to pull back what is given out already, though they always find themselves necessitated to yield at last to the efforts of the animal, to prevent his sinking their boat. If he runs out the 200 fathoms of line contained in one boat, that belonging to another is immediately fastened to the end of the first, and so on; and there have been instances, where all the rope belonging to the six boats has been necessary, though half that quantity is seldom required. The whale cannot stay long below water, but again comes up to blow; and being now much fatigued and wounded, stays longer above water than usual. This gives another boat time to come up with him, and he is again struck with an harpoon. He again descends, but with less force than before: and when he comes up again, is generally incapable of descending, but suffers himself to be wounded and killed with long lances which the men are provided with for the purpose. He is known to be near death when he spouts up the water deeply tinged with blood.

The whale being dead, is lashed alongside the ship. They then lay it on one side, and put two ropes, one at the head, and the other in the place of the tail, which, together with the fins, is struck off as soon as he is taken, to keep these extremities above water. On the off-side of the whale are two boats, to receive the pieces of fat, utensils and men, that might otherwise fall into the water on that side. These precautions being taken, three or four men with irons at their feet, to prevent slipping, get on the whale, and begin to cut

* A late improvement has been made in the method of discharging the harpoon; namely, by shooting it out of a kind of swivel or musquatoon: but it does not appear, that since this improvement was made, the whale-fishing ships have had better success than before.

out pieces of about three feet thick and eight long, which are hauled up at the capstan or windlass. When the fat is all got off, they cut off the whiskers of the upper jaw with an axe. Before they cut, they are all lashed to keep them firm; which also facilitates the cutting, and prevents them from falling into the sea: when on board, five or six of them are bundled together, and properly stowed; and after all is got off, the carcass is turned a-drift, and devoured by the bears, who are very fond of it. In proportion as the large pieces of fat are cut off, the rest of the crew are employed in slicing them smaller, and picking out all the lean. When this is prepared, they stow it under the deck, where it lies till the fat of all the whales is on board; then cutting it still smaller, they put it up in casks in the hold, cramming them very full and close. Nothing now remains but to sail homewards, where the fat is to be boiled and melted down into train-oil.

It were in vain to speak in this place of the advantages that may be derived to Great Britain from the whale fishery. We shall only remark, that the legislature justly considering that trade as of great national importance, bestowed upon it at different periods very considerable encouragements. In particular, every British vessel of 200 tons or upwards, bound to the Greenland seas on the whale-fishery, if found to be duly qualified according to the act, obtained a license from the Commissioners of the customs to proceed on such voyage: and on the ship's return, the master and mate making oath that they proceeded on such voyage and no other, and used all their endeavours to take whales, &c. and that all the whale-fins, blubber, oil, &c. imported in their ship, were taken by their crew in those seas, there was allowed 40s. for every ton according to the admeasurement of the ship.

It was afterwards found, however, that so great a bounty was neither necessary to the success of the trade, nor expedient with regard to the public. In 1786, therefore, the acts conferring the said emoluments being upon the point of expiring, the subject was brought under the consideration of Parliament; and it was proposed to continue the former measures, but with a reduction of the bounty from 40s. to 30s. In proposing this alteration, it was stated, "that the sums which this country had paid in bounties for the Greenland fishery amounted to £1,265,461; that, in the last year, we had paid £94,858; and that, from the consequent deduction of the price of the fish, the public at present paid 60 per cent. upon every cargo. In the Greenland fishery there were employed 6000 seamen, and these seamen cost government £13. 10s. each man per annum, though we were never able

to obtain more than 500 of that number to serve on board our ships of war. Besides the vast encouragement given to the trade, had occasioned such a glut in the market, that it was found necessary to export considerable quantities; and thus we paid a large share of the purchase money for foreign nations, as well as for our own people, besides supplying them with the materials of several important manufactures." This proposition was opposed by several members, but was finally carried; and the propriety of the measure became very soon apparent. At that time (1786) the number of ships employed from England in the whale-fishery to Davis's Straits and the Greenland seas amounted to 139, besides 15 from Scotland. The proposed alteration took place the next year (1787); and notwithstanding the diminution of the bounty, the trade increased; the number of ships employed the same year from England amounting to 217, and the next year (1788) to 222.

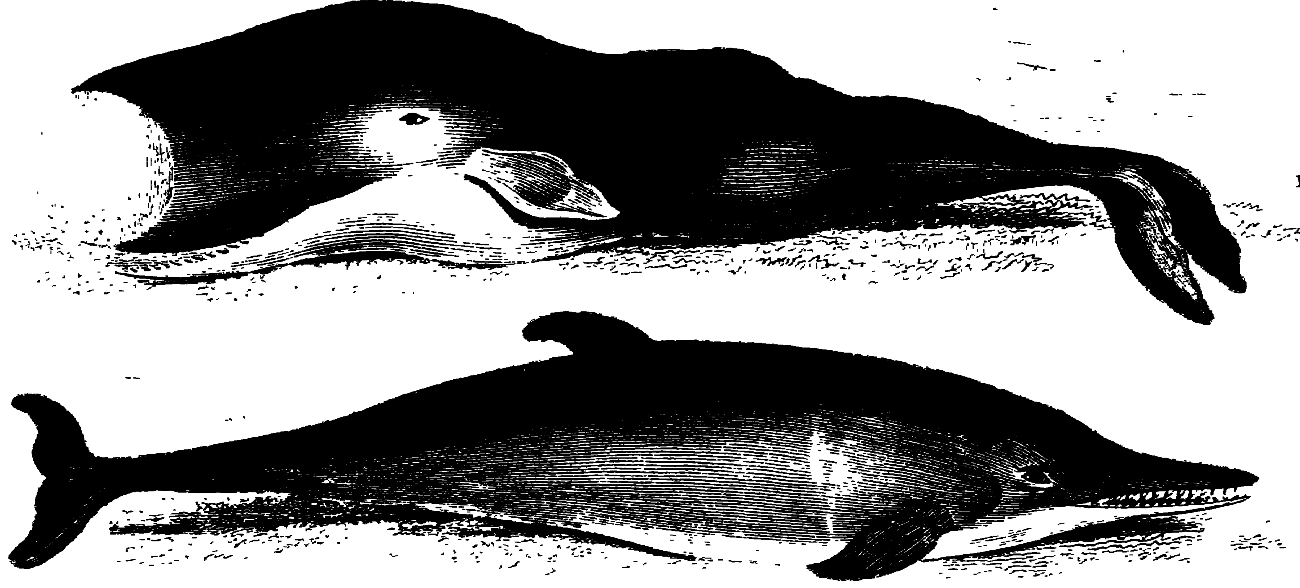
The flesh of this animal is a dainty to some nations; and the savages of Greenland, as well as those near the south pole, are fond of it to distraction. They eat the flesh, and drink the oil, which is a first-rate delicacy. The finding a dead whale is an adventure considered among the fortunate circumstances of their wretched lives. They make their abode beside it; and seldom remove till they have left nothing but the bones.

The Narwhal, or Sea-Unicorn is not so large as the whale, not being above sixty feet long. Its body is slenderer than that of the whale, and its fat not in so great abundance. But this great animal is sufficiently distinguished from all others of the deep by its tooth or teeth, which stand pointing directly forward from the upper jaw, and are from nine to fourteen feet long. In all the variety of weapons with which Nature has armed her various tribes, there is not one so large or so formidable as this. This terrible weapon is generally found single; and some are of opinion that the animal is furnished with but one by nature; but there is at present the skull of a narwhal at the Stadthouse as Amsterdam, with two teeth. The tooth, or, as some are pleased to call it, the horn of the narwhal, is as straight as an arrow, about the thickness of the small of a man's leg, wreathed in the manner we sometimes see twisted bars of iron; it tapers to a sharp point; and is whiter, heavier, and harder than ivory. It is generally seen to spring from the left side of the head directly forward in a straight line with the

body; and its root enters into the socket above a foot and a half. Notwithstanding its appointments for combat, these long and pointed tusks, amazing strength, and unmatchless celerity, the narwhal is one of the most harmless and peaceful inhabitants of the ocean. It is seen constantly and inoffensively sporting among the other great monsters of the deep, no way attempting to injure them, but pleased in their company. The Greenlanders call the narwhal the fore runner of the whale; for wherever it is seen, the whale is shortly after sure to follow. This may arise as well from the natural passion for society in these animals, as from both living upon the same food, which are the insects described in the preceding section. These powerful fishes make war upon no other living creature; and, though furnished with instruments to spread general destruction, are as innocent and as peaceful as a drove of oxen. The narwhal is much swifter than the whale, and would never be taken by the fishermen but for those very tusks, which at first appear to be its principal defence. These animals are always seen in herds of several at a time; and whenever they are attacked, they crowd together in such a manner, that they are mutually embarrassed by their tusks. By these they are often locked together, and are prevented from sinking to the bottom. It seldom happens, therefore, but the fishermen make sure of one or two of the hindmost, which very well reward their trouble.

The CACHALOT, or SPERMACETI WHALE, has several teeth in the under jaw, but none in the upper. As there are no less than seven distinctions among whales, so also there are the same number of distinctions in the tribe we are describing. This tribe is not of such enormous size as the whale, properly so called, not being above sixty feet long and sixteen feet high. In consequence of their being more slender, they are much more active than the common whale; they remain a longer time at the bottom, and afford a smaller quantity of oil. As in the common whale the head was seen to make a third part of its bulk, so in this species the head is so large as to make one half of the whole. The cachalot is as destructive among the lesser fishes as the whale is harmless: and can at one gulph swallow a shoal of fishes down its enormous gullet. Linnæus tells us that this fish pursues and terrifies the dolphins and porpesses so much as often to drive them on shore.

But, how formidable soever this fish may be to its fellows of the deep, it is by far the most valuable, and the most



1. Blunt headed Cachalot. 2. Dolphin

sought after by man, as it contains two very precious drugs, spermaceti and ambergris: the whole oil of this fish is very easily convertible into spermaceti. This is performed by boiling it with a lye of pot-ash, and hardening it in the manner of soap. Candles are now made of it, which are substituted for wax, and sold much cheaper.

As to the ambergris, which is sometimes found in this whale, it was long considered as a substance found floating on the surface of the sea; but time, that reveals the secrets of the mercenary, has discovered that it chiefly belongs to this animal. The name which has been improperly given to the former substance, seems more justly to belong to this; for the ambergris is found in the place where the seminal vessels are usually situated in other animals. It is found in a bag of three or four feet long, in round lumps, from one to twenty pounds weight, floating in a fluid rather thinner than oil, and of a yellowish colour. There are never seen more than four at a time in one of these bags; and that which weighed twenty pounds, and which was the largest ever seen, was found single. These balls of ambergris are not found in all fishes of this kind, but chiefly in the oldest and strongest.

The blunt-headed chachalot is fifty-four feet in length. Its greatest circumference is just beyond the eyes, and is thirty feet. The upper jaw is five feet longer than the lower, which is ten feet. The head is above one third the size of the fish. The end of the upper jaw is blunt, and near nine feet high, the spout-hole placed near the end of it. The teeth are placed in the lower jaw, twenty-three on each side, all pointing outwards, and in the upper jaw, opposite, are a number of holes to receive them when the mouth is closed; they are about eighteen inches long.

The Grampus, the Dolphin, and the Porpesse. All these fish have teeth both in the upper and lower jaw, and are much less than the whale. The grampus, which is the largest, never exceeds twenty feet. It may also be distinguished by the flatness of its head, which resembles a boat turned upside down. The porpesse resembles the grampus in most things, it is seldom above eight feet long; its snout also more resembles that of an hog. The dolphin has a strong resemblance to the porpesse, except that its snout is longer and more pointed. They have all fins on the back; they all have heads very large, like the rest of the whale kind; and resemble each other in their appetites, their manners, and conformations; being equally voracious, active, and roving.

The great agility of these animals prevents their often being taken. They seldom remain a moment above water; sometimes, indeed, their too eager pursuits expose them to danger; and a shoal of herrings often allures them out of their depth. In such a case, the hungry animal continues to flounder in the shallows till knocked on the head, or till the retiring tide seasonably comes to its relief. But all this tribe, and the dolphin in particular, are not less swift than destructive. No fish could escape them, but from the awkward position of the mouth, which is placed in a manner under the head: yet, even with these disadvantages, their depredations are so great, that they have been justly styled the plunderers of the deep.

As for the rest, we are told, that these animals go with young ten months; that, like the whale, they seldom bring forth above one at a time, and that in the midst of summer: that they live to a considerable age; though some say not above twenty-five or thirty years; and they sleep with the snout above water.

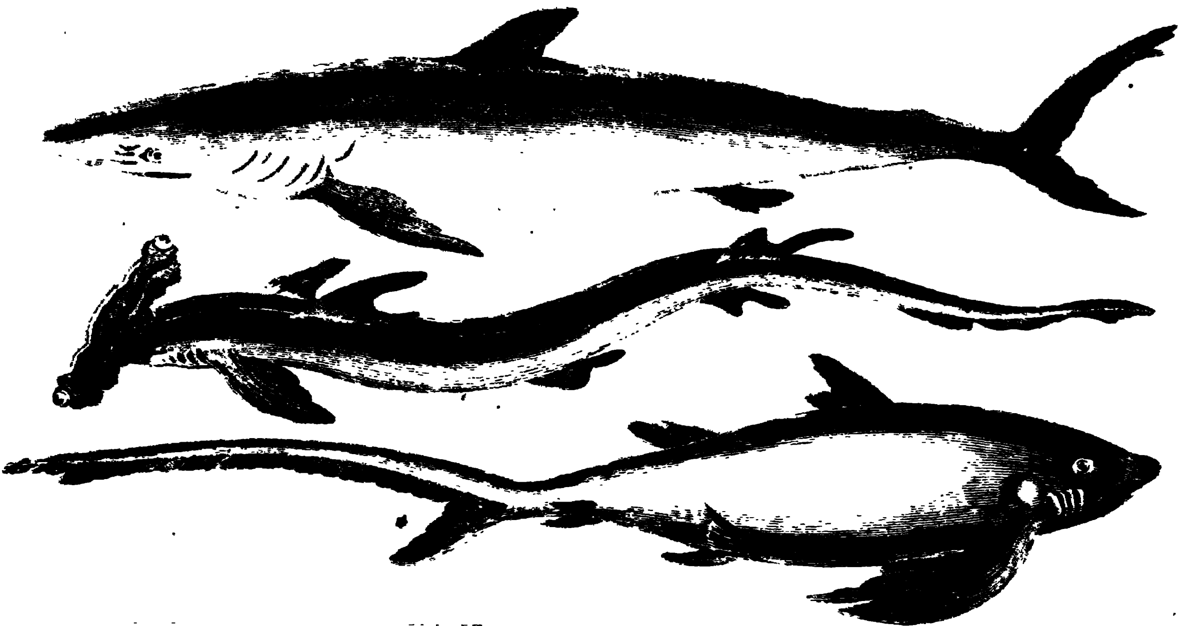
CHAP. XXX.

Of Cartilaginous Fishes—Of the SHARK—*The white Shark, The blue, the long-tailed, the basking, the hammer-headed and the angel Shark—The Dogfish and its varieties—The Sawfish—The* RAY—*The Skate—The Roughray—The Thornback—Manner of fishing for flat fish—The Sting Ray—The Torpedo—The Sea Devil—The Sea Eagle—The* LAMPREY—*The* STURGEON—*The Isinglass fish—The* ANGLER—*The* DIODON, *or Sun fish—The oblong, short, and globe Diodon—The* LUMP-SUCKER—*The Sea Snail—The* PIPE FISH—*The* HIPPOCAMPUS—*The Sea* PORCUPINE—*The* GALLEY FISH.

Cartilaginous Fishes.

THE first great distinction which the cartilaginous tribe of fishes exhibit is, in having cartilages or gristles instead of bones. The size of all fishes increases with age; but from the pliancy of the bones in this tribe, they seem to have no bounds placed to their dimensions: and it is supposed that they grow larger every day till they die.

Cartilaginous fishes unite the principal properties of both



1. White Shark 2. Hammer headed Shark. 3. Long tailed Shark

the other classes in their conformation: like the cetaceous tribes, they have organs of hearing, and lungs: like the spinous kinds, they have gills, and an heart without a partition.

From this structure of their gills, these animals are enabled to live a longer time out of water than other fishes. The cartilaginous shark, or ray, live some hours after they are taken; while the spinous herring or mackarel expire a few minutes after they are brought on shore. Some of this class bring forth their young alive; and some bring forth eggs, which are afterwards brought to maturity. In all, however, the manner of gestation is nearly the same; for upon dissection, it is ever found, that the young, while in the body, continue in the egg till a very little time before they are excluded: these eggs they may properly be said to hatch within their body; and as soon as their young quit the shell, they begin to quit the womb also.

The Shark. Of all the inhabitants of the deep those of the shark kind are the fiercest and most voracious.

The *White Shark* is sometimes seen to rank even among the whales for magnitude; and is found from twenty to thirty feet long. Some assert that they have seen them of four thousand pounds weight; and we are told particularly of one, that had a human corpse in his belly. The head is large, and somewhat flatted; the snout long, and the eyes large. The mouth is enormously wide; as is the throat, and capable of swallowing a man with great ease. But its furniture of teeth is still more terrible. Of these there are six rows extremely hard, sharp-pointed, and of a wedge-like figure. It is asserted that there are seventy-two in each jaw, which make one hundred and forty-four in the whole; yet others think that their number is uncertain; and that, in proportion as the animal grows older, these terrible instruments of destruction are found to encrease. With these the jaws both above and below appear planted all over; but the animal has the power of erecting or depressing them at pleasure. When the shark is at rest, they lie quite flat in his mouth; but when he prepares to seize his prey, he erects all this dreadful apparatus by the help of a set of muscles that join them to the jaw; and the animal he seizes, dies pierced with an hundred wounds in a moment.

Nor is this fish less terrible to behold as to the rest of his form: his fins are larger, in proportion; he is furnished with great goggle eyes, which he turns with ease on every side, so as to see his prey behind him as well as before: and his whole aspect is marked with a character of malignity: his skin also is rough, hard and prickly; being that substance which covers instrument cases, called shagreen.

No fish can swim so fast as the shark, he outstrips the swiftest ships. Such amazing powers, with such great appetites for destruction, would quickly unpeople even the ocean, but providentially the shark's upper jaw projects so far above the lower, that he is obliged to turn on one side (not on his back, as is generally supposed) to seize his prey. As this takes some small time to perform, the animal pursued seizes that opportunity to make his escape.

Still, however, the depredations he commits are frequent and formidable. The shark is the dread of sailors in all hot climates; where, like a greedy robber, he attends the ships, in expectation of what may drop overboard. A man who unfortunately falls into the sea at such a time, is sure to perish A sailor that was bathing in the Mediterranean, near Antibes, in the year 1744, while he was swimming about fifty yards from the ship, perceived a monstrous fish making towards him and surveying him on every side, as fish are often seen to look round a bait. The poor man, struck with terror at its approach, cried out to his companions in the vessel to take him on board. They accordingly threw him a rope with the utmost expedition, and were drawing him up by the ship's side, when the shark darted after him from the deep, and snapped off his leg.

Mr. Pennant tells us, that the master of a Guinea-ship, finding a rage for suicide prevail among his slaves, from a notion the unhappy creatures had, that after death they should be restored again to their families, friends and country; to convince them at least that some disgrace must attend them here, he ordered one of their dead bodies to be tied by the heels to a rope, and so let down into the sea; and though it was drawn up again with great swiftness, yet, in that short space, the shark had bitten off all but the feet.* A Guinea captain, was by stress of weather, driven into the harbour of Belfast, with a lading of very sickly slaves, who in the manner above-mentioned, took every opportunity to throw themselves over board when brought upon deck, as is usual, for the benefit of the fresh air. The captain perceiving, among others, a woman slave attempting to drown herself, pitched upon her as a proper example to the rest: as he supposed that they did not know the terrors attending death, he ordered the woman to be tied with a rope under the arm-pits, and to let her down into the water. When the poor creature was thus plunged in, and about half way down, she was heard to give a terrible shriek, which at first was ascribed to her fears of drowning; but soon after the water appearing red all round her, she was drawn up, and it was found that a shark, which had followed the ship, had bit her off from the middle.

The usual method of our sailors to take the shark, is by

baiting a great hook with a piece of beef or pork, which is thrown out into the sea by a strong cord, strengthened near the hook with an iron chain. Without this precaution, the shark would quickly bite the cord in two, and thus set himself free. It is no unpleasant amusement to observe this voracious animal coming up to survey the bait, particularly when not pressed by hunger He approaches it, examines it, swims round it, seems for a while to neglect it, perhaps apprehensive of the cord and chain: he quits it for a little; but his appetite pressing, he returns again; appears preparing to devour it, but quits it once more When the sailors have sufficiently diverted themselves with his different evolutions, they then make a pretence, by drawing the rope, as if intending to take the bait away; it is then that the glutton's hunger excites him; he darts at the bait, and swallows it, hook and all. Sometime, however, he does not so entirely gorge the whole, but that he once more gets free; yet even then, though wounded and bleeding with the hook, he will again pursue the bait until he is taken. When he finds the hook lodged in his maw, his utmost efforts are then excited, but in vain, to get free; he tries with his teeth to cut the chain; he pulls with all his force to break the line; he almost seems to turn his stomach inside out, to disgorge the hook; in this manner he continues his formidable though fruitless efforts, till quite spent; he suffers his head to be drawn above water, and the sailors confining his tail by a noose, in this manner draw him on ship board, and dispatch him. This is done by beating him on the head till he dies: yet even that is not effected without difficulty and danger; the enormous creature, terrible even in the agonies of death, still struggles with his destroyers; nor is there an animal in the world that is harder to be killed. Even when cut in pieces, the muscles still preserve their motion, and vibrate for some minutes after being separated from the body. Another method of taking him, is by striking a barbed instrument, called a fizgig, into his body, as he brushes along by the side of the ship. As soon as he is taken up, to prevent his flouncing, they cut off the tail with an ax, with the utmost expedition.

This is the manner in which Europeans destroy the shark; but some of the negroes along the African coast take a bolder and more dangerous method to combat their terrible enemy. Armed with nothing more than a knife, the negro plunges into the water, where he sees the shark watching for his prey, and boldly swims forward to meet him; though the great animal does not come to provoke the combat, he does not avoid it, and suffers the man to approach him, but just as he turns upon his side to seize the aggressor, the negroe

watches the opportunity, plunges his knife in the fish's belly, and pursues his blows with such success, that he lays the ravenous tyrant dead at the bottom: he soon however returns, fixes the fish's head in a noose, and drags him to shore, where he makes a noble feast for the adjacent villages.

Nor is man alone the only enemy this fish has to fear: the *Remora*, or sucking fish, is probably a still greater, and follows the shark every where. This fish has got a power of adhering to whatever it sticks against, in the same manner as a cupping-glass sticks to the human body. It is by such an apparatus that this animal sticks to the shark, drains away its moisture, and produces a gradual decay.

There are several other species of the shark. The *Blue Shark* is distinguished by a fine smooth skin on its back of a blue colour. The observation of Ælian, that the young of this animal when pursued, will take refuge in the belly of its mother, by swimming down her mouth, is confirmed by one of the best of modern icthyologists (Rondeletius). Mr. Pennant, however does not apprehend this circumstance to be peculiar to the blue shark, but rather common to the whole genus.

The *Long-tailed Shark*. The author whom we have just quoted, mentions the dimensions of one of these animals which will serve to give an idea of the general proportions of this species. The fish in question was thirteen feet in length, of which the tail was more than six, the upper lobe much longer than the lower. The body was round and short, the nose short and pointed. The eyes large, and placed immediately over the corners of the mouth. This fish was anciently called the *Sea Fox*, from its supposed cunning.

The *Basking Shark* has nothing of the rapacious nature of these animals, but feeds entirely on sea plants. They sometimes visit our coasts in the summer season, when they will lie basking in the sun on the surface of the water, and are so tame as to suffer themselves to be stroked. They are in length from three to twelve yards, and sometimes even larger.

The *Hammer-headed Shark, or Balance Fish*, is an animal of a very peculiar form.• The head is placed transversely to the body, like the head of a hammer or mallet. It is terminated at each end by an eye, which is so placed that it more conveniently looks downward than either upward or sideways. In the farther part of the forehead near the eyes on each side there is a large oblong foramen or orifice, serving either for hearing or smelling, or perhaps for both. The mouth is very large, placed under the head, and armed with four rows of teeth extremely sharp. The tail consists of two fins one longer

than the other. The back is ash-colour, and the belly white. This fish is chiefly caught in the Mediterranean.

The *Angel Shark*, or *Monk Fish* is the animal which connects the Shark genus with that of the Ray, and partakes in some degree of the nature of both. It grows to a very large size, sometimes an hundred weight. The head is large, the teeth broad at the base, slender and sharp at the point. Like those of other sharks, they are capable of being raised or depressed at the pleasure of the animal. The eyes are oblong, and placed lengthways in the head. They are sunk very deep and almost covered with the skin: and have more the expression of malevolence than of fire or spirit.

The skin is very rough; the back is of a pale ash-colour, with a line of large lumps with pointed prickles along it. The pectoral fins are extremely large and resemble wings, whence probably it derives the name of angel. This species of shark feeds on flounders and flat fish. It is extremely fierce and dangerous to be approached. Mr. Pennant speaks of a fisherman whose leg was terribly torn by one of them as it lay in his net in shallow water. It is not unfrequent on all our coasts.

In this genus are included the several species of *Dog Fish*, which are common in most parts of the world, and retain much of the form and all the habits of the shark. Nay, their appetite for human flesh is said to be so great, that they will sometimes even venture upon the shore to gratify this violent propensity. The most remarkable are the *Tope*, which weighs sometimes seventy pounds. The *Spotted Dog-Fish*, *the Picked Dog-Fish*, which has spines on its back fins; the *Smooth Hound*, which is without the spines; and the *Porbeagle*.

Authors have classed under this genus a singular fish which is well known in the Western Ocean under the name of the *Saw Fish*. It is remarkable for a curious instrument with which it is furnished at the snout resembling a saw, and which is sometimes of the length of five feet. From this circumstance it is evident that it must grow to a very large size.

The Ray. The whole of this genus resemble each other very strongly in their figure; nor is it easy without experience to distinguish one from another. The stranger to this dangerous tribe may imagine he is only handling a skate when he is instantly struck numb by the torpedo; and he may suppose he has caught a thornback till he is stung by the fire-flare.

It is by the spines that these animals are distinguished from each other. The *skate* has the middle of the back rough, and a single row of spines on the tail. The *sharp nosed ray* has ten spines that are situated towards the middle of the back. The *rough ray* has its spines spread indiscriminately over the whole back. The *thorn back* has its spines disposed in three rows upon the back. The *sting ray*, or *fire-flare* has but one spine, but indeed a terrible one. This dangerous weapon is placed on the tail, about four inches from the body, and is not less than five inches long. It is of a flinty hardness, the sides thin, sharp pointed, and closely and sharply bearded the whole way. The *torpedo* has no spines that can wound; but in the place of them it is possessed of one of the most potent and extraordinary faculties in nature.

Of all the larger fish of the sea, these are the most numerous; and they owe their numbers to their size. Except the white shark and chachalot alone, there is no other fish that has a swallow large enough to take them in; and their spines make them a still more dangerous morsel. Yet the size of some is such, that even the shark himself is unable to devour them: we have seen some of them in England weigh above two hundred pounds; but that is nothing to their enormous bulk in other parts of the world. Labat tells us of a prodigious ray that was speared by the negroes at Guadaloupe, which was thirteen feet eight inches broad, and about ten feet from the snout to the insertion of the tail. The tail itself was in proportion, for it was no less than fifteen feet long; twenty inches broad at its insertion, and tapering to a point. The body was two feet in depth; the skin as thick as leather, and marked with spots, which spots, in all of this kind, are only glands, that supply a mucus to lubricate and soften the skin. This enormous fish was utterly unfit to be eaten by the Europeans: but the negroes chose out some of the nicest bits, and carefully salted them up as a most favourite provision.

It is chiefly during the winter season that our fishermen fish for the ray; but the Dutch, who are indefatigable, begin their operations earlier, and fish with better success than we do. The method practised by the fishermen of Scarborough is thought to be the best among the English; and, as Mr. Pennant has given a very succcint account of it, we shall present it to the reader.

"When they go out to fish, each person is provided with three lines: each man's lines are fairly coiled upon a flat



1. Thornback. — 2. Torpedo. — 3. Sea Eagle. — 4. Saw Fish.

oblong piece of wicker work; the hooks being baited and placed very regularly in the centre of the coil. Each line is furnished with two hundred and eighty hooks, at the distance of six feet two inches from each other. The hooks are fastened to lines of twisted horse-hair, twenty-seven inches in length. The line is laid across the current, and always remains upon the ground about six hours.

"The best bait for all kinds of fish, is fresh herring cut in pieces of a proper size. Next to herrings are the lesser lampreys, which come all the winter by land-carriage from Tadcaster. The next baits in esteem are small haddocks cut in pieces, sand-worms, muscles, and limpets: and lastly, when none of these can be found, they use bullock's liver. The hooks used there are much smaller than those employed at Iceland and Newfoundland; and are two inches and a half long in the shank. The line is made of small cording, it is always tanned before it is used, and is in length about three miles."

But this extent of line is nothing to what the Italians throw out in the Mediterranean. Their fishing is carried on in a tartan, which is a vessel much larger than ours; and they bait a line of no less than twenty miles long, with above ten or twelve thousand hooks. This line is not regularly drawn every six hours, as with us, but remains for some time in the sea; and it requires the space of twenty-four hours to take it up. By this apparatus they take rays, sharks, and other fish; some of which are above a thousand pounds weight. When they have caught any of this magnitude, they strike them through with an harpoon, to bring them on board, and kill them as fast as they can.

This method of catching fish is obviously fatiguing and dangerous; but the value of the capture generally repays the pains. The skate and the thornback are very good food; and their size, which is from ten pounds to two hundred weight, very well rewards the trouble of fishing for them. But it sometimes happens that the lines are visited by very unwelcome intruders; by the rough ray, the fire-flare, or the torpedo.

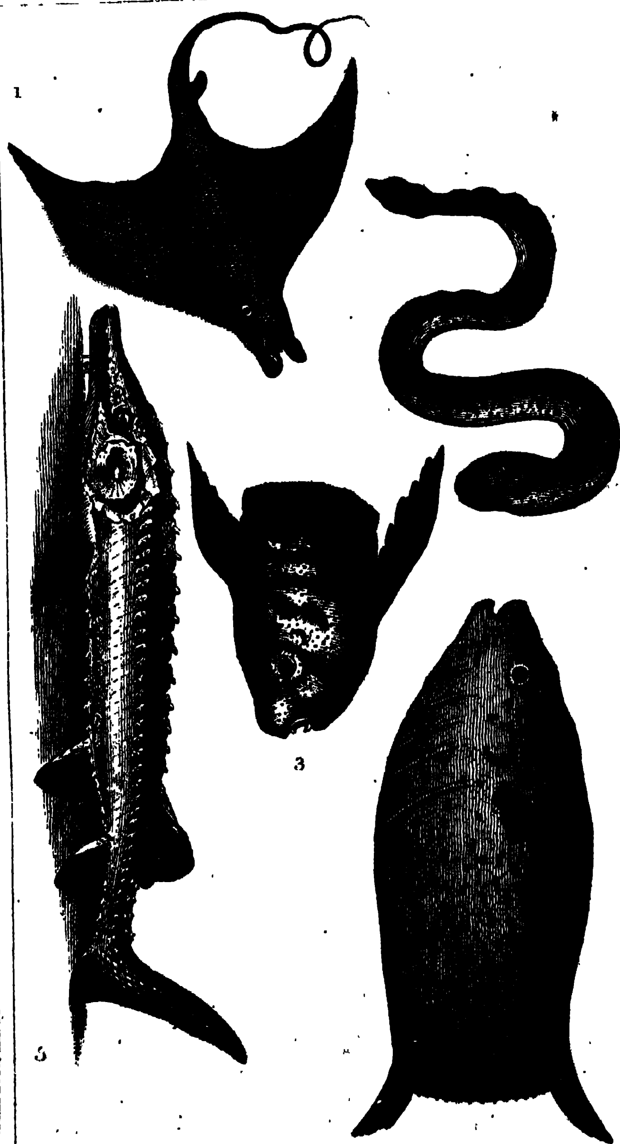
The rough ray inflicts but slight wounds with the prickles with which its whole body is furnished. To the ignorant it seems harmless, and a man would at first sight venture to take it in his hand, without any apprehension; but he soon finds, that there is not a single part of its body that is not armed with spines: and that there is no way of seizing the animal, but by the little fin at the end of the tail.

But this animal is harmless, when compared to the sting

ray, or fire-flare, which seems to be the dread of even the boldest and most experienced fishermen. The spine, with which it wounds its adversaries, is not venomous as has been vulgarly supposed, but is, in fact, a weapon of offence belonging to this animal, and capable, from its barbs, of inflicting a very terrible wound, attended with dangerous symptoms; it is fixed to the tail, as a quill is into the tail of a fowl, and is annually shed in the same manner.

The *Torpedo* is equally formidable and well known with the former; but the manner of its operating is to this hour a mystery to mankind. The body of this fish is almost circular, and thicker than others of the ray kind; the skin is soft, smooth, and of a yellowish colour, marked, as ali the kind, with large annular spots; the eyes very small; the tail tapering to a point; and the weight of the fish from a quarter to fifteen pounds. Redi found one twenty-four pounds weight. To all outward appearance, it is furnished with no extraordinary powers; it has no muscles formed for particularly great exertions; no internal conformation perceptibly differing from the rest of its kind; yet such is that unaccountable power it possesses, that, the instant it is touched, it numbs not only the hand and arm, but sometimes also the whole body. The shock received, by all accounts, much resembles the stroke of an electrical machine; sudden, tingling, and painful. "The instant," says Kempfer, "I touched it with my hand, I felt a terrible numbness in my arm, and as far up as the shoulder. Even if one treads upon it with the shoe on, it affects not only the leg, but the whole thigh upwards. Those who touch it with the foot, are seized with a stronger palpitation than even those who touch it with the hand. This numbness bears no resemblance to that which we feel when a nerve is a long time pressed and the foot is said to be asleep; it rather appears like a sudden vapour, which, passing through the pores, in an instant penetrates to the very springs of life, whence it diffuses itself over the whole body, and gives real pain. The nerves are so affected, that the person struck imagines all the bones of his body, and particularly those of the limb that received the blow, are driven out of joint. All this is accompanied with an universal tremor, a sickness of the stomach, a general convulsion, and a total suspension of the faculties of the mind."

Though we are ignorant of the nature of the torpedo, yet we have some facts which relate to the manner of its acting. Reaumur, who made several trials upon this animal, has at least convinced the world that it is not neces-



1. Sea Devil. — 2. Lamprey. — 3. Short Diodon.
4. Oblong Diodon. — 5. Sturgeon.

sarily, but by an effort that the torpedo numbs the hand of him that touches it. He tried several times, and could easily tell when the fish intended the stroke, and when it was about to continue harmless. Always before the fish intended the stroke, it flattened the back, raised the head and the tail; and then, by a violent contraction in the opposite direction, struck with its back against the pressing finger; and the body, which before was flat, became humped and round.

The most probable solution of this phenomenon is, that it depends upon electricity. When the fish is dead, the whole power is destroyed, and it may be handled or eaten with perfect security: it is now known that there are more fish than this of the ray kind, possessed of the numbing quality, which has acquired them the name of the torpedo.

There are two other species of ray, which for their singular form deserve to be distinguished. The first is called the *Sea Devil.* Its nose and snout are divided, as it were, into two horns; and its sides are terminated by the fins. Its skin, towards the head, is variegated with dusky spots. It grows, sometimes, to the length of six or seven feet.

The *Sea Eagle* is another species of this deformed tribe. It receives its name from its thin and expanded sides, which resemble the spread wings of an eagle. Its head, in some degree, resembles that of a toad; its eyes are large and prominent. It is generally found small, but is said sometimes to grow to a very large size.

The Lamprey. There is a species of the lamprey served up as a great delicacy among the modern Romans very different from ours. Whether theirs be the murena of the ancients we shall not pretend to say; but there is nothing more certain than that our lamprey is not.

The lamprey known among us is differently estimated, according to the season in which it is caught, or the place where it has been fed. Those that leave the sea to deposit their spawn in fresh waters are the best; those that are entirely bred in our rivers, and that have never been at sea, are considered as much inferior to the former. Those that are taken in the months of March, April, or May, just upon their leaving the sea, are reckoned very good; those that are caught after they have cast their spawn, are found to be flabby, and of little value.

The lamprey much resembles an eel in its general appearance, but is of a lighter colour, and rather a clumsier make. It differs, however, in the mouth, which is round, and

placed rather obliquely below the end of the nose. It more resembles the mouth of a leech than an eel; and the animal has a hole on the top of the head, through which it spouts water, as in the cetaceous kind. There are seven holes on each side for respiration; and the fins are formed rather by a lengthening out of the skin, than any set of bones or spines for that purpose. As the mouth is formed resembling that of a leech, so it has a property, resembling that animal, of sticking close to, and sucking any body it is applied to. It is extraordinary the power they have of adhering to stones; which they do so firmly, as not to be drawn off without some difficulty. We are told of one that weighed but three pounds, and yet it stuck so firmly to a stone of twelve pounds, that it remained suspended at its mouth; from which it was separated with no small difficulty. As to the intestines of the lamprey, it seems to have but one great bowel, running from the mouth to the vent, narrow at both ends, and wide in the middle.

So simple a conformation seems to imply an equal simplicity of appetite. In fact, the lamprey's food is either slime and water, or such small water-insects as are scarcely perceivable. Perhaps its appetite may be more active at sea, of which it is properly a native; but when it comes up into our rivers, it is hardly perceived to devour any thing.

Its usual time of leaving the sea, which it is annually seen to do in order to spawn, is about the beginning of spring; and after a stay of a few months it returns again to the sea. Their preparation for spawning is peculiar; their manner is, to make holes in the gravelly bottoms of rivers; and on this occasion their sucking power is particularly serviceable; for if they meet with a stone of a considerable size, they will remove it, and throw it out. Their young are produced from eggs in the manner of flat fish; the female remains near the place where they are excluded, and continues with them till they come forth. She is sometimes seen with her whole family playing about her; and after some time she conducts them in triumph back to the ocean.

There is a small species of the lamprey, which is called the *Lampern*, and about Oxford the *Pride* of the Isis. It is frequently potted by itself, and sometimes along with the larger species.

The STURGEON in its general form resembles a fresh-water pike. The nose is long; the mouth is situated beneath, being small, and without jaw-bones or teeth But,

is formidable enough to appearance. It is long, pentagonal, and covered with five rows of large bony knobs, one row on the back, and two on each side, and a number of fins to give it greater expedition. Of this fish there are three species, the *common sturgeon*, the *caviar sturgeon*, and the *buso*, or isinglass fish. The largest sturgeon we have heard of caught in Great Britain, was a fish taken in the Eske, where they are most frequently found, which weighed four hundred and sixty pounds. An enormous size to those who have only seen our fresh-water fishes!

As the sturgeon is an harmless fish, and no way voracious, it is never caught by a bait in the ordinary manner of fishing, but always in nets. From the quality of floundering at the bottom it has received its name; which comes from the German verb *stoeren*, signifying to wallow in the mud. That it lives upon no large animals is obvious to all those who cut it open, where nothing is found in its stomach but a kind of slimy substance, which has induced some to think it lives only upon water and air.

The usual time for the sturgeon to come up rivers to deposit its spawn, is about the beginning of summer, when the fishermen of all great rivers make a regular preparation for its reception. At Pillau particularly the shores are formed into districts, and allotted to companies of fishermen, some of which are rented for about three hundred pounds a year. The nets in which the sturgeon is caught, are made of small cord, and placed across the mouth of the river; but in such a manner that, whether the tide ebbs or flows, the pouch of the net goes with the stream. The sturgeon thus caught, while in the water, is one of the strongest fishes that swims, and often breaks the net to pieces that encloses it; but the instant it is raised with its head above water, all its activity ceases; it is then a lifeless, spiritless lump, and suffers itself to be tamely dragged on shore.

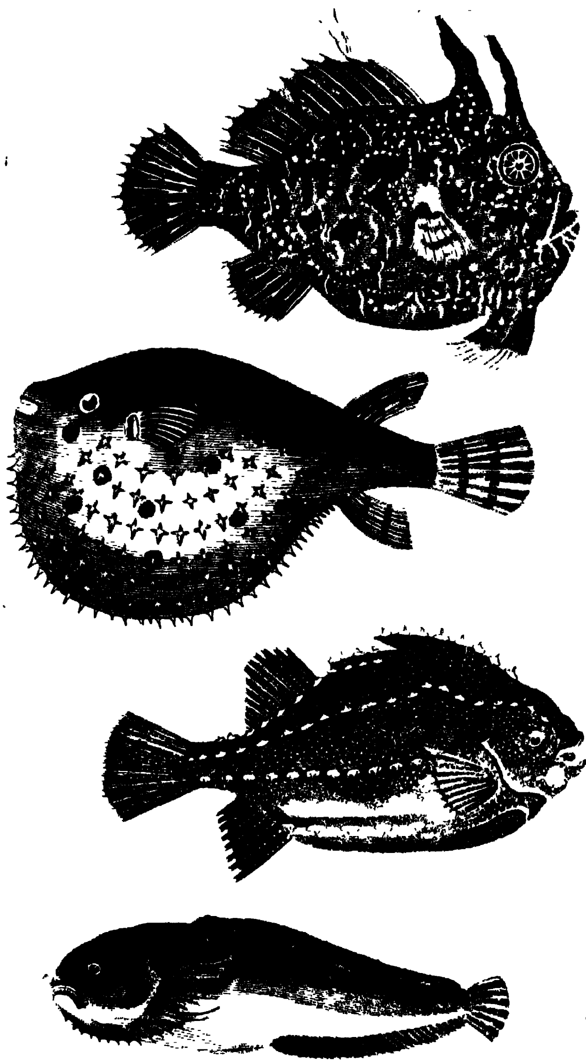
The flesh of this animal pickled is very well known at all the tables of Europe; and is even more prized in England than in any of the countries where it is usually caught. The fishermen have two different methods of preparing it. The one is by cutting it in long pieces lengthwise, and having salted them, by hanging them up in the sun to dry: the fish thus prepared is sold in all the countries of the Levant, and supplies the want of better provision. The other method, which is usually practised in Holland, and along the shores of the Baltic, is to cut the sturgeon crosswise into short pieces, and put it into small barrels, with a pickle made of

though it is so harmless and ill provided for war, the body salt and saumure. This is the sturgeon which is sold in England, and of which great quantities come from the North.

A very great trade is also carried on with the roe of the sturgeon, preserved in a particular manner, and called Caviar: it is made from the roe of all kinds of sturgeon, but particularly the second. This is much more in request in other countries of Europe than with us. To all these high relished meats, the appetite must be formed by degrees; and though formerly even in England it was very much in request at the politest tables, it is at present sunk entirely into disuse. It is still, however, a considerable merchandize among the Turks, Greeks, and Venetians. Caviar somewhat resembles soft soap in consistence; but it is of a brown, uniform colour, and is eaten as cheese with bread.

The *Huso*, or *Isinglass fish*, furnishes a still more valuable commodity. This fish is caught in great quantities in the Danube, from the months of October to January: it is seldom under fifty pounds weight, and often above four hundred: its flesh is soft, glutinous, and flabby; but it is sometimes salted, which makes it better tasted, and then it turns red like salmon. It is for the commodity it furnishes that it is chiefly taken. The manner of making it is this: they take the skin, the entrails, the fins, and the tail of this fish, and cut them into small pieces; these are left to macerate in a sufficient quantity of warm water, and they are all boiled shortly after with a slow fire, until they are dissolved and reduced to a jelly: this jelly is spread upon instruments made for the purpose, so that in drying, it assumes the form of parchment, and, when quite dry, it is then rolled into the form which we see it in the shops. This valuable commodity is principally furnished from Russia, where they prepare great quantities surprisingly cheap.

The ANGLER, or FISHING FROG, in shape very much resembles a tadpole, or young frog, but of an enormous size, for it grows to above five feet long, and its mouth is sometimes a yard wide. The eyes are placed on the top of the head, and are encompassed with prickles; immediately above the nose are two long beards or filaments, small in the beginning, but thicker at the end, and round; these, as it is said, answer a very singular purpose; for, being made somewhat resembling a fishing-line, it is asserted, that the animal converts them to the purpose of fishing. With these extended, the fishing frog is said to hide in muddy waters, and to leave nothing but the beards to be seen; the curio-



1. Angler or Fishing Frog. 2. Globe Diodon
3. Lump Sucker. 4. Unctuous Sucker.

sity of the smaller fish bring them to view these filaments, and their hunger induces them to seize the bait; upon which the animal in ambush instantly draws in its filaments with the little fish that had taken the bait, and devours it without mercy. This story, though apparently improbable, has found credit among some of our best naturalists. The fishermen have, in general, a great regard for this ugly fish, as it is an enemy to the dog fish, the bodies of those fierce and voracious animals being often found in its stomach: whenever they take it, therefore, they always set it at liberty.

The DIODON, or SUN FISH, is easily distinguished by its very peculiar form; having a very deep body, and, as it were, cut off in the middle. There are three well known species.

The *Oblong Diodon* grows to an immense size, and has been known to weigh upwards of five hundred pounds. In its form it resembles a bream or carp cut off in the middle. The mouth is very small, and contains in each jaw two broad teeth, with sharp edges. The dorsal, and the anal fins, are placed at the extremity of the body; the tail fin is narrow, and fills up all the space between these two fins. When boiled, it is observed to turn entirely to a glutinous jelly, and would probably serve all the purposes of isinglass; but it is not found in sufficient plenty, at least upon our coasts.

The *short Diodon* differs from the preceding, in being much shorter and deeper, resembling the head of a fish rather than a perfect animal; both kinds are found on the western coasts of Britain, but in greater plenty in the warmer climates of Europe.

The *Globe Diodon* is common to Europe and Carolina, but is more plentiful at the latter place. The form of the body is usually oblong, but when alarmed it has the power of inflating its belly to a globular shape of an immense size. This seems designed as a defence against fish of prey, which are further terrified by the innumerable spines with which that part is defended, and which may be erected at pleasure. One taken at Penzance in Cornwall, was one foot seven inches in length.

The LUMP-SUCKER is trifling in size, compared to the preceding: its length is but sixteen inches, and its weight about four pounds; the shape of the body is like that of a bream, deep, and it swims edgeways; the back is sharp and

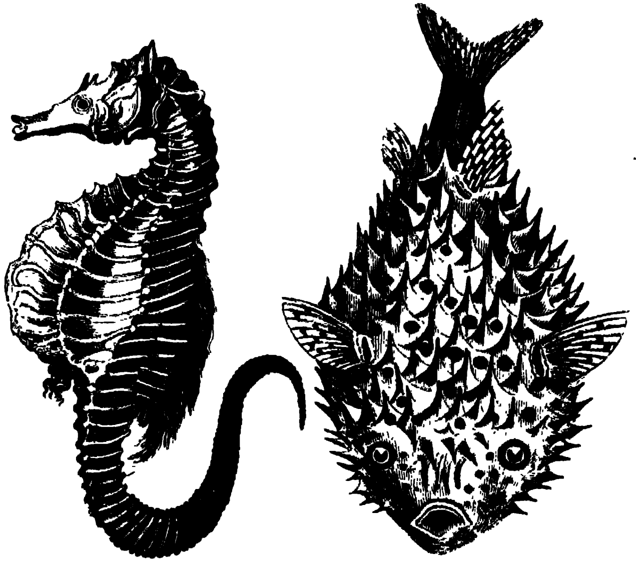
elevated, and the belly flat; the lips, mouth, and tongue of this animal are of a deep red; the whole skin is rough, with bony knobs, the largest row is along the ridge of the back; the belly is of a bright crimson colour; but what makes the chief singularity in this fish, is, an oval aperture in the belly, surrounded with a fleshy, soft substance, that seems bearded all round; by means of this part it adheres with vast force to any thing it pleases. If flung into a pail of water, it will stick so close to the bottom, that on taking the fish by the tail, one may lift up pail and all, though it hold several gallons of water. Great numbers of these fish are found along the coasts of Greenland in the beginning of summer, where they resort to spawn. Their roe is remarkably large, and the Greenlanders boil it to a pulp for eating. They are extremely fat, but not admired in England, being both flabby and insipid.

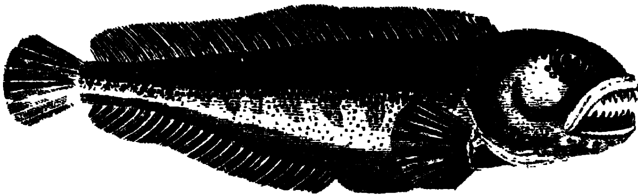
The *Unctuous Sucker*, or *Sea Snail* takes its name from the soft and unctuous texture of its body, resembling the snail upon land. It is almost transparent, and soon dissolves, and melts away. It is but a little animal, being not above five inches long. The colour, when fresh taken, is of a pale brown, and the shape of the body is round. It is taken in England, at the mouths of rivers, four or five miles distant from the sea.

The body of the PIPE FISH in, the thickest part, is not thicker than a swan-quill, while it is above fifteen inches long. Its general colour is an excellent olive brown, marked with numbers of bluish lines, pointing from the back to the belly. It is viviparous; for, on crushing one that was just taken, hundreds of very minute young ones were observed to crawl about.

The HIPPOCAMPUS which, from the form of its head, some call the Sea Horse, never exceeds nine inches in length. It is about as thick as a man's thumb, and the body is said, while alive, to have hair on the fore part, which falls off when it is dead. The snout is a sort of tube, with a hole at the bottom, to which there is a cover, which the animal can open and shut at pleasure. Behind the eyes there are two fins, which look like ears; and above them are two holes, which serve for respiration. It, upon the whole, more resembles a great caterpillar than a fish.

The SEA PORCUPINE is almost round, has a mouth like









1. Hippocampus. 2. Sea Porcupine. 3. Wolf - Fish
4. Electrical Eel. 5. Pipe Fish.

a frog, and is from seven inches to two feet long. Like the porcupine, whence it takes its name, it is covered over with long thorns or prickles, which point on every side; and when the animal is enraged, it can blow up its body as round as a bladder. Of this extraordinary creature there are many species: some threatening only with spines, and others defended with a bony helmet that covers the head.

These frightful animals are of different sizes; some not bigger than a foot-ball, and others as large as a bushel. The Americans often amuse themselves with the barren pleasure of catching these frightful creatures by a line and hook baited with a piece of sea-crab. The animal approaches the bait with its spines flattened; but when hooked and stopped by the line, all its spines are suddenly erected; the whole body being armed in such a manner at all points, that it is impossible to lay hold of it on any part. For this reason it is dragged to some distance from the water, and there it quickly expires. In the middle of the belly of all these there is a sort of bag or bladder filled with air, by the inflation of which the animal swells itself in the manner already mentioned.

To these animals may be added the GALLEY FISH, which Linnæus degrades into the insect tribe, under the title of the Medusa. To the eye of an unmindful spectator, this fish seems a transparent bubble, swimming on the surface of the sea, or like a bladder variously and beautifully painted with vivid colours, where red and violet predominate, as variously opposed to the beams of the sun. It is, however, an actual fish; the body of which is composed of cartilages, and a very thin skin filled with air, which thus keeps the animal floating on the surface, as the waves and the winds happen to drive. Persons who happen to be walking along the shore often tread upon these animals; and the bursting of their body yields a report as when one treads upon the swim of a fish. It has eight broad feet with which it swims, or which it expands to catch the air as with a sail. It fastens itself to whatever it meets by means of its legs, which have an adhesive quality. But what is most remarkable in this extraordinary creature, is the violent pungency of the slimy substance, with which its legs are smeered. If the smallest quantity but touch the skin, so caustic is its quality, that it burns it like hot oil dropped on the part affected. The pain is worse in the heat of the day, but ceases in the cool of the evening.

CHAP. XXXI.

Of Bony Fishes in general—Apodal Fishes—The EEL—*The Conger—The Electrical Eel—The* WOLF-FISH—*The* LAUNCE—*The* SWORD-*fish—Jugular Fishes—The* DRAGONET—*The* WEEVER—*The* COD—*Three and five bearded Cods—The Haddock—The Whiting Pout—The Bib—The Poor—The Coal Fish—The Pollack—The Whiting—The Hake—The Ling—The Burbot—The* BLENNY—*The crested and viviparous Blenny—Thoracic Fishes—The* GOBY, *or Rock Fish—The Remora, or Sucking Fish—The* BULLHEAD—*The Miller's Thumb—The Pogge—The* DOREE—*The Opah—The* FLOUNDER—*The Hollibut—The Plaise—The Dab—The Sole—The Lantern Fish—The Turbot—The Pearl—The Whiff—The* GILT-HEAD—*The Dorado—The* WRASSE—*The Ballan, &c.—The* PERCH—*The Basse—The Ruffe—The* STICKLE-BOCK—*The* MACKEREL—*The Tunny—The Scad—The* SURMUDLET—*The* GURNARD—*Abdominal Fishes—The* LOACH—*The* SALMON—*The Sea Trout—The White Trout—The Samlet—The Trout—The Gillaroo, or Gizzard Trout—The Char—The Grayling—The Smelt—The Gwiniad—The* PIKE—*The Sea Needle—The Saury—The* ARGENTINE—*The* ATHERINE—*The* MULLET—*The* FLYING FISH—*The* HERRING—*The Pilchard—Herring Fishery—The Sprat—The Anchovy—The Shad—The* CARP—*The Barbel—The Tench—The Gudgeon—The Bream—The Rud—The Crucian—The Roach—The Dace—The Chub—The* BLEAK—*The White Bait—The* MINNOW—*The Gold and Silver Fish—The Art of Angling—Baits, &c. for Fishes—Praise of Angling.*

BONY FISHES.

THE third general division of fishes is into that of the Spinous, or bony kind. These are obviously distinguished from the rest by having a complete bony covering to their gills; by their being furnished with no other method of breathing but gills only; by their bones, which are sharp and thorny; and their tails, which are placed in a situation perpendicular to the body.

The history of any one of this order very much resembles that of all the rest. They breathe air and water through

the gills; they live by rapine, each devouring such animals as its mouth is capable of admitting; and they propagate, not by bringing forth their young alive, as in the cetaceous tribes, nor by distinct eggs, as in the generality of the cartilaginous tribes, but by spawn, or peas, as they are generally called which they produce by hundreds of thousands.

The bones of this order of fishes, when examined but slightly, appeared to be entirely solid; yet, when viewed more closely, every bone will be found hollow, and filled with a substance less rancid and oily than marrow. These bones are very numerous, and pointed; and, as in quadrupeds, are the props or stays to which the muscles are fixed, which move the different parts of the body.

The number of bones in all spinous fishes of the same kind is always the same. It is a vulgar way of speaking, to say, that fishes are, at some seasons, more bony than at others; but this scarce requires contradiction. It is true, indeed, that fish are at some seasons much fatter than at others; so that the quantity of the flesh being diminished, and that of the bones remaining the same, they appear to increase in number, as they actually bear a greater proportion.

As the spinous fish partake less of the quadruped in their formation than any others, so they can bear to live out of their own element a shorter time. Some, indeed, are more vivacious in air than others; the eel will live several hours out of water; and the carp has been known to be fattened in a damp cellar. The method is, by placing it in a net well wrapped up in wet moss, the mouth only out, and then hung up in a vault. The fish is fed with white bread and milk, and the net now and then plunged into the water.

It is impossible to account for the different operations of the same element upon animals, that, to appearance have the same conformation. To some fishes, bred in the sea, fresh water is immediate destruction; on the other hand, some fishes, that live in our lakes and ponds, cannot bear the salt water. This circumstance may possibly arise from the superior weight of the sea water. As, from the great quantity of salt dissolved in its composition, it is much heavier than fresh water, so it is probable it lies with greater force upon the organs of respiration, and gives them their proper and necessary play: on the other hand, those fish which are used only to fresh water, cannot bear the weight of the saline fluid, and expire in a manner suffocated in the grossness of the strange element. There are some tribes, however, that spend a part of their season in one, and a part in the other. Thus the *salmon*, the *shad*, the *smelt*,

and the *flounder*, annually quit the ocean, and come up our rivers to deposit their spawn. This seems the most important business of their lives; and there is no danger which they will not encounter, even to the surmounting precipices, to find a proper place for the deposition of their future offspring. The salmon, upon these occasions, is seen to ascend rivers five hundred miles from the sea, and to brave, not only the dangers of various enemies, but also to spring up cataracts as high as a house. As soon as they come to the bottom of the torrent, they seem disappointed to meet the obstruction, and swim some paces back; they then take a view of the danger that lies before them, survey it motionless for some minutes, advance, and again retreat; till at last, summoning up all their force, they take a leap from the bottom, their body straight, and strongly in motion; and thus most frequently clear every obstruction. It sometimes happens, however, that they want strength to make the leap; and then, in our fisheries, they are taken in their descent.

But the length of the voyage performed by these fishes is sport, if compared to what is annually undertaken by some tribes that constantly reside in the ocean. Of this kind are the cod, the haddock, the whiting, the mackerel, the tunny, the herring, and the pilchard.

The power of increasing in these animals exceeds our idea, as it would, in a very short time, outstrip all calculation: and a single herring, if suffered to multiply unmolested and undiminished for twenty years, would shew a progeny greater in bulk than ten such globes as that we live upon. Although the usual way with spinous fishes is to produce by spawn, yet there are some, such as the eel and the blenny, that are known to bring forth their young alive.

With respect to the growth of fishes, it is observed, that among carps particularly, the first year they grow to about the size of the leaf of a willow tree; at two years they are about four inches long. They grow but one inch more the the third season, which is five inches. Those of four years old are about six inches; and seven after the fifth. From that to eight years old they are found to be larger in proportion to the goodness of the pond, from eight to twelve inches. With regard to sea-fish, the fishermen assure us, that a fish must be six years old before it is fit to be served up to table. They instance it in the growth of a mackerel. They assure us that those of a year old are as large as one's finger; and those of two years are about twice that length; at three and four years, they are that small kind of mackerel

that have neither milts nor rows; and between five and six they are those full grown fish that are served up to our tables. In the same manner, with regard to flat fishes, they tell us that the turbot and plaise at one year are about the size of a crown piece; the second year as large as the palm of one's hand; and, at the fifth and six year, they are large enough to be served up to table. Thus, it appears, that fish are a considerable time in coming to their full growth, and that they are a long time the prey of others before it comes to their turn to be destroyers.*

The greediness with which sea-fish devour the bait is prodigious, if compared with the manner they take it in fresh water. The lines of such fishermen who go off to sea are coarse, thick, and clumsy, compared to what are used by those who fish at land. Their baits are seldom more than a piece of fish, or the flesh of some quadruped, stuck on the hook in a bungling manner; and scarce any art is employed to conceal the deception. But it is otherwise in fresh water; the lines must often be drawn to an hair-like fineness; they must be tinctured of the peculiar colour of the stream; the bait must be formed with the nicest art, and even, if possible, to exceed the perfection of nature: yet still the fishes approach it with diffidence, and often swim round it with disdain. The cod, on the banks of Newfoundland, the instant the hook, which is only baited with the guts of the animal last taken, is dropped into the water, darts to it at once, and the fishermen have but to pull up as fast as they throw down. But it is otherwise with those who fish in fresh water, they must wait whole hours in fruitless expectation; and *the patience of a fisherman* is proverbial among us.

As fish are enemies to one another, so each species is infested with worms of different kinds, peculiar to itself. The great fish abound with them; and the little ones are not entirely free. These troublesome vermin lodge themselves either in the jaws, and the intestines internally, or near the fins without. When fish are healthy and fat, they are not much annoyed by them; but in winter, when they are lean or sickly, they then suffer very much.

Nor does the reputed longevity of this class secure them from their peculiar disorders. They are not only affected by too much cold, but there are frequently certain dispositions of the element in which they reside, unfavourable to their health and propagation. Some ponds they will not

* Traites de Peches, par Monsieur Duhamel. Sect. 3. p. 100.

breed in, however artfully disposed for supplying them with fresh recruits of water, as well as provision. In some seasons also they are found to feel epidemic disorders, and are seen dead by the water side, without any apparent cause.

The fact of some fishes in warm climates being poisonous when eaten, cannot be doubted. We have a paper in the Philosophical Transactions, giving an account of the poisonous qualities of those found at New Providence, one of the Bahama islands. The author there assures us, that the greatest part of the fish of that dreary coast are all of a deadly nature: their smallest effects being to bring on a terrible pain in the joints, which, if terminating favourably, leaves the patient without any appetite for several days after. It is not those of the most deformed figure, or the most frightful to look at, that are alone to be dreaded; all kinds, at different times, are alike dangerous; and the same species which has this day served for nourishment, is the next, if tried, found to be fatal.

As this order of fishes is extremely numerous, various modes of classing them have been invented by different naturalists. The simplest is that of Linnæus, who ranks them in four divisions, according to the position of the fins.

The first division is what that celebrated naturalist terms APODAL. This includes the most imperfect of the order, viz. *those which want the ventral or belly fins* (as the wolf fish), and consists of the following genera.

The EEL is the first genus of this division, and includes several species.

The *common eel* is a very singular fish in several things that relates to its natural history, and in some respects borders on the nature of the reptile tribe.

It is known to quit its element, and, during night, to wander along the meadows, not only for change of habitation, but also for the sake of prey, feeding on the snails it finds in its passage.

During winter, it beds itself deep in the mud, and continues in a state of rest like the serpent kind. It is very impatient of cold, and will eagerly take shelter in a wisp of straw flung into a pond in severe weather, which has sometimes been practised as a method of taking them. Albertus goes so far as to say, that he has known eels to shelter in a hay-rick, yet all perished through excess of cold.

It has been observed, that in the river Nyne there is a variety of small eel, with a lesser head and narrower mouth than the common kind; that it is found in clusters in the

bottom of the river, and is called the bed-eel; these are sometimes roused up by violent floods, and are never found at that time with meat in their stomachs. This bears such an analogy with the clustering of blindworms in their quiescent state, that we cannot but consider it as a further proof of partial agreement in the nature of the two genera.

The ancients adopted a most wild opinion about the generation of these fish, believing them to be either created from the mud, or that the scrapings of their bodies which they left on the stones, were animated, and became young eels. Some moderns gave into these opinions, and into others that were equally extravagant. They could not account for the appearance of these fish in ponds that were never stocked with them, and were even so remote as to make their being met in such places a phænomenon that they could not solve. But there is much reason to believe, that many waters are supplied with these fish by the aquatic fowl of prey, in the same manner as vegetation is spread by many of the land birds, either by being dropped as they carry them to feed their young, or by passing quick through their bodies, as is the case with herons; and such may be the occasion of the appearance of these fish in places where they were never seen before. As to their immediate generation, it has been sufficiently proved to be effected in the ordinary course of nature, and that they are viviparous.

They are extremely voracious, and very destructive to the fry of fish.

No fish lives so long out of water as the eel; it is extremely tenacious of life, and its parts will move a considerable time after they are flayed and cut in pieces.

The eel is placed by Linnæus in the genus of *murœna*, his first of the apodal fish, or such which want the ventral fins.

The eyes are not placed remote from the end of the nose: the irides are tinged with red: the under jaw is longer than the upper; the teeth are small, sharp, and numerous; beneath each eye is a minute orifice; at the end of the nose two others, small and tubular.

This fish is furnished with a pair of pectoral fins, rounded at their ends. Another narrow fin on the back, uniting with that of the tail; and the anal fin joins it in the same manner beneath.

Behind the pectoral fins is the orifice to the gills, which are concealed in the skin.

Eels vary much in their colours, from a sooty hue to a

light olive green; and those which are called silver eels have their bellies white, and a remarkable clearness throughout.

Besides these, there is another variety of this fish, known in the Thames by the name of grigs, and about Oxford by that of grigs or gluts. These are scarce ever seen near Oxford in the winter, but appear in spring, and bite readily at the bait, which common eels in that neighbourhood will not. They have a larger head, a blunter nose, thicker skin, and less fat, than the common sort; neither are they so much esteemed nor do they often exceed three or four pounds in weight.

Common eels grow to a large size, sometimes so great as to weigh fifteen or twenty pounds, but that is extremely rare. As to instances brought by Dale and others, of these fish increasing to a superior magnitude, we have much reason to suspect them to have been congers, since the enormous fish they describe have all been taken at the mouth of the Thames or Medway.

The eel is the most universal of fish, yet is scarce ever found in the Danube, though it is very common in the lakes and rivers of Upper Austria.

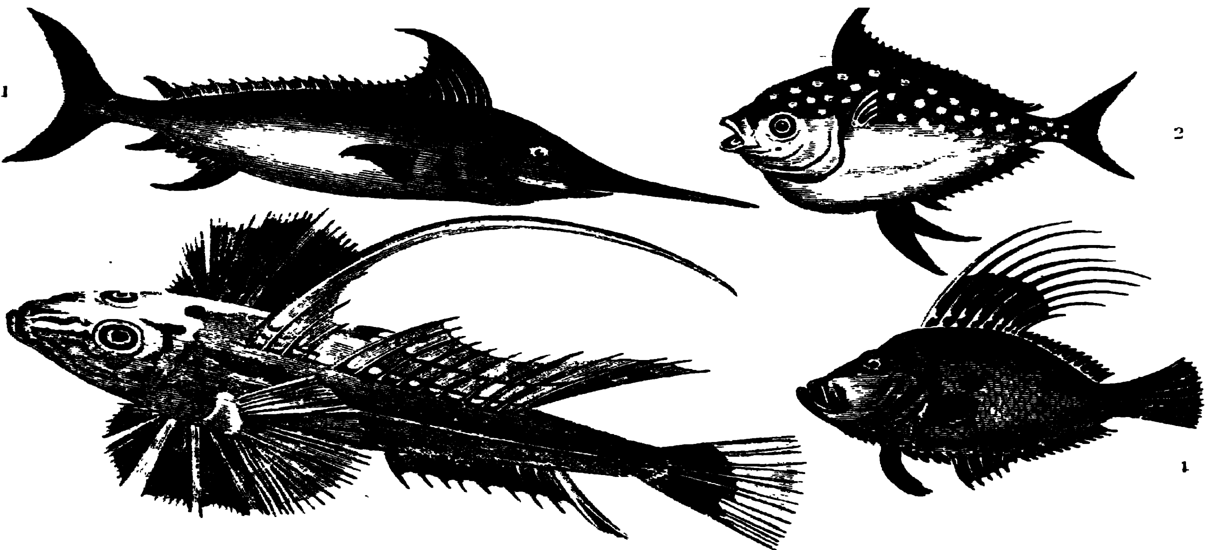
The Romans held this fish very cheap, probably from its likeness to a snake.

> "For you is kept a sink-fed snake-like eel."
>
> Juv. Sat. v.

On the contrary, the luxurious Sybarites were so fond of these fish, as to exempt from every kind of tribute the persons who sold them.

The *Conger Eel* grows to an immense size: they have been taken ten feet and a half long, and eighteen inches in circumference in the thickest part. They differ from the common eel not only in their size, but in being of a darker colour, and in the form of the lower jaw, which is shorter than the upper. They are extremely voracious, and prey upon other fish, particularly upon crabs, when they have cast their shell. The fishermen are very fearful of the large congers, lest they should endanger their legs by clinging round them; they therefore kill them as soon as possible by striking them on the navel. On the coast of Cornwall these fish constitute a considerable article of commerce, where they are salted and dried, and afterwards ground to powder which is purchased by the Spaniards for the purpose of thickening their soups.

But the most extraordinary fish of this kind is the *electrical eel.* It is a fresh-water fish, found in the river of Surinam. It is said sometimes to grow to the length of twenty



1. Sword Fish.—2. Opah.—3. Dragonet.—4. John Dorce.

feet; but its usual size is from three to four, and about ten or fourteen inches in circumference about the thickest part of the body. The head is large and flat, and perforated with small holes. The jaws are without teeth. The back and sides are covered with many light-coloured spots. The pectoral fins are round and small, and only serve to raise the fish's head out of the water to breathe, which he is obliged to do every four or five minutes. The skin of the body is formed into a number of wrinkles, or annular bands, which give it a worm-like appearance. The electrical shock is conveyed either through the hand, or any metallic conductor which touches the fish; and a stroke of one of the largest kind proves instant death to even the human species. This extraordinary power is given to this fish, not only for defence, but subsistence. For whenever small fishes or worms are thrown into the water, they are first struck dead by the electric power of the animal, and afterwards swallowed by him.

The WOLF FISH has the body roundish and slender; the head large and blunt; the fore-teeth, above and below, conical; the grinding teeth, and those in the palate, round; the fin covering the gills has six rays.

This animal seems to be confined to the northern seas, and sometimes is found near the coasts of Scotland. It grows to a very large size, being frequently taken of the length of seven feet, and even more. It is a most ravenous and fierce fish, and when taken fastens upon every thing within its reach. It is said even to bite so hard, that it will seize upon an anchor, and leave the marks of its teeth on it. It feeds almost entirely on shell-fish, the hardest of which it easily crushes with its jaws. It has so formidable and disagreeable an appearance, that it is only eaten by the fishermen, who, however, prefer it to hollibut.

The LAUNCE, or SAND EEL, is known by a body slender and roundish; the head terminated by a beak; the teeth of a hair-like fineness; the fin covering the gills with seven rays. It grows to the length of nine or ten inches, and is found in most of our sandy shores during the summer months. It conceals itself among the sand, whence, during flood-tide, they are rooted up, and devoured by the porpesses; and on the recess of the tide they are drawn out with a hook by the fishermen. They are commonly made use of as a bait for other fish, but they are also very delicate eating.

The SWORD-FISH is very common in the Mediterranean, and is much esteemed for food by the Sicilians. It grows to a very large size, sometimes to the weight of 100 pounds. It is of a long and rounded body, largest near the head, and tapering by degrees to the tail. The skin is rough, the back black, and the belly white. It has one fin on the back, running almost its whole length. It has one pair of fins also at the gills. But the most remarkable part of this fish is the snout, which, in the upper jaw, runs out in the figure of a sword, sometimes to the length of three feet, the under jaw is much shorter.

The second division consists of the JUGULAR FISHES, or those *which have ventral fins before the pectoral*, or nearer to the gills.

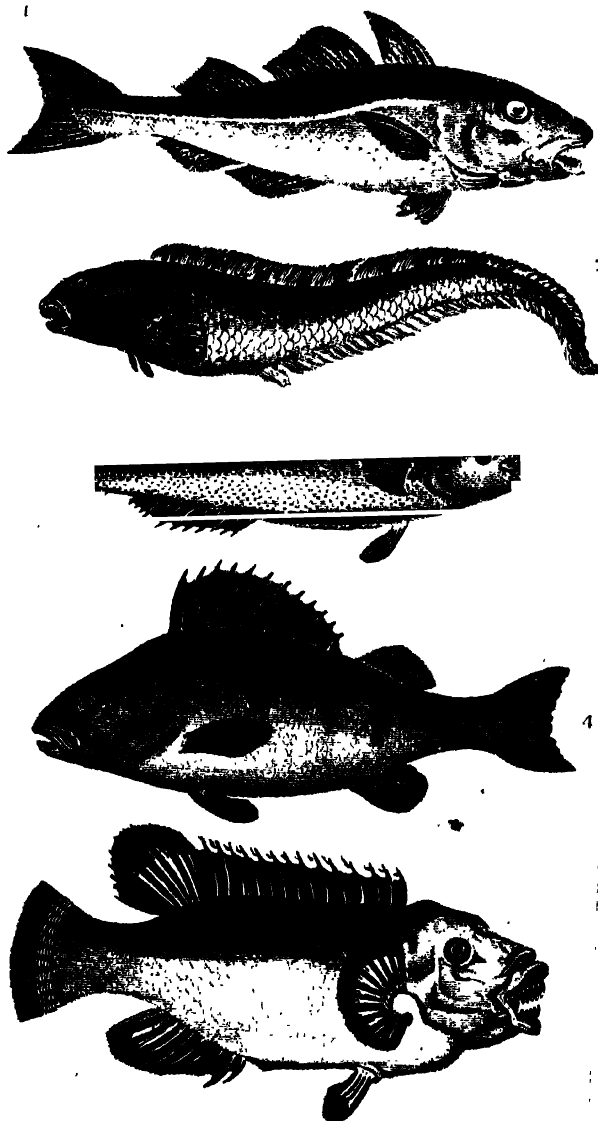
The DRAGONET is the first genus which naturalists have remarked in this division. Its general characters are the upper lip doubled, the eyes very near each other, two breathing apertures on the hind part of the head, and the first rays of the dorsal fin extremely long. There are two species described by Mr. Pennant.

The *Gemmeous Dragonet*, which is about ten or twelve inches long, with a large head, and a body slender, round, and smooth. The colours of this fish are extremely beautiful; when it is just taken, they are yellow, blue, and white The blue has all the splendour of the most beautiful gems. The throat is black; and the membranes of the fins are very thin and delicate. The old English writers have called this fish the yellow gurnard, but in reality it has no one character of that genus.

The *Sorded Dragonet* resembles the preceding, but its first dorsal fin is not so long, nor are its colours so brilliant and lively.

The WEEVER is known sometimes to grow to the length of twelve inches, though it is commonly found much smaller. The lower jaw slopes down very abruptly, and its back is armed with strong spines. It buries itself in the sand, leaving only its nose out, and when trod upon strikes forcibly with its spines, which are said to be venomous, though probably the pain and inflammation attending the wounds which it inflicts, depend on the habit of the person or the part which is struck. It is good food.

The COD is a most extensive genus, including a number



1. Cod. — 2. Viviparous Blenny. — 3. Remora,
4. Perch. — 5. Ballan.

of well-kown and useful fishes. The general characters are a smooth head, the fin that covers the gills consisting of seven rays, all the fins covered with a common skin, the ventral fins slender, and ending in a point. It has teeth in the jaws, and a series of small teeth closely set together in the palate. Most of the species have also the chin bearded.

The *common cod* is short in proportion to its bulk, the belly is large and prominent, its eyes are large, and at the end of the lower jaw is a small beard. It is ash-coloured, spotted with yellow, and the belly white; on the back are three soft fins.

There are also the *three bearded and five bearded Cods*, both of which differ from the common sort, not only in this character, but in having only two back fins, the latter very long.

The *Cod* seems to be the foremost of the wandering tribe of fishes, and is only found in our northern part of the world. This animal's chief place of resort is on the banks of Newfoundland, and the other sand banks that lie off Cape Breton. That extensive flat seems to be no other than the broad top of a sea mountain, extending for above five hundred miles long, and surrounded with a deeper sea. Hither the cod annually repair in numbers, beyond the power of calculation, to feed on the quantity of worms that are to be found there in the sandy bottom. Here they are taken in such quantities, that they supply all Europe with a considerable share of provision. The English have stages erected all along the shore for salting and drying them; and the fishermen, who take them with the hook and line, which is their method, draw them in as fast as they can throw out. This immense capture, however, makes but a very small diminution when compared to their numbers; and when their provision there is exhausted, or the season for propagation returns, they go off to the polar seas, where they deposit their spawn.

The *Haddock* is a well known fish of this genus, which much resembles the cod, but is smaller; it is also distinguished by a black mark on each side beyond the gills, which superstition ascribes to the impression which St. Peter left with his finger and thumb, when he took the tribute money out of the fish's mouth, which tradition would have us believe to have been of this species.

The *Whiting Pout* is another fish of the same kind, which in size seldom exceeds a foot. The back is much arched; the scales larger than that of the cod; and on each side of the jaw are seven or eight punctures.

The *Rib* grows also to the length of a foot, and the sides are finely tinged with gold.

The *Poor* is the only species of cod found in the Mediterranean; it is not more than six inches long.

The *Coal Fish* takes its name from the black colour it sometimes assumes. It grows to the length of two feet and a half, and is of a more elegant shape than the cod. The flesh is little esteemed when fresh, but is commonly salted and dried for sale. The fry of this fish, however, is called *parr*, and is esteemed good food.

The *Pollack* does not grow to a very large size, but is a very good eating fish. The first back fin has eleven rays, the middle nineteen, the last sixteen. The tail is a little forked; the colour of the back is dusky, in some inclining to green; the belly is white.

The *Whiting* is a fish of an elegant form, and the most delicate food of all the genus. The first back fin has fifteen rays, the second eighteen, the third twenty. The back is a pale brown, and the belly silvery white. It seldom exceeds twelve inches in length.

The seven last species have three back fins; the *hake*, the *ling*, and the *burbot*, have only two; and the *torsk* has only one.

The BLENNY has the body oblong; the head obtuse; the teeth a single range; the fin covering the gills with six spines; the ventral fins have two small blunt bones in each; it has one dorsal fin which is prickly, and several of the species are crested, or have a small fin like a crest, upon their heads.

The Blenny is a small fish, measuring from five to seven inches. It is found among stones upon rocky coasts, and sometimes in the mouths of rivers. One species of this fish is viviparous, and brings forth two or three hundred at a time. These are very common at the mouth of the Esk, at Whitby, in Yorkshire.

The third division is called the THORACIC, or *those fishes which have the belly fins immediately under the pectoral.* For this kind see the Ballan.

The GOBY, or ROCK-FISH, is not above six inches long. The body is soft, slippery and slender; the head large, the cheeks inflated. It has two back fins, and the ventral fins coalesce, and form a sort of funnel, by which these fish fix themselves immoveably to the rocks.

The *Remora*, or *Sucking fish*, which has been already in part described, appears to belong to this genus. In shape it resembles a herring, but on the head has an apparatus for fixing itself to a ship, or to the body of another fish. It is an inhabitant of the Indian ocean.

The BULL-HEAD is a well-known genus, including several species, all of which have a large head armed with spines.

The *river bull-head* or *Miller's thumb*, is very common in all our clear lakes. It rarely exceeds three inches in length, and is easily distinguished by a broad flat head, excellently adapted for insinuating itself under stones. It is of a dusky colour, mixed with dirty yellow, and has two back fins.

The *Pogge*, or *armed bull-head*, is found on most of the European coasts, and is distinguished by its large bony head, which is armed at the nose with four short upright spines, and by a number of white beards at the throat. It is about five inches long.

But the most formidable of this genus is the *Father Lasher*, or *Sea Scorpion*. It is about eight or nine inches long. The nose, the top of the head, and the back fins are armed with strong sharp spines. It is exceedingly common in the Newfoundland seas, and makes a principal article of food in Greenland.

The DOREE is almost equally famous in the legends of superstition with the haddock, and is its rival in the honour of being the fish from which St. Peter took the tribute money, leaving on its sides the mark of his finger and thumb. The form of this fish is very disgusting. Its body is oval, and much compressed at the sides. Its snout is long, and its mouth wide. The first back fin consists of ten spiny rays, with long filaments, the second of twenty-four soft rays. The tail is round at the end. The colour of the body is olive, varied with light blue and white; while living it has the appearance of gilding, whence its name *doree* (gilt.)

Such is the unpleasant form of this fish, that it was long before it attracted the notice of the epicure; Mr. Pennant observes, indeed, that to the celebrated actor, Mr. Quin, it is chiefly indebted for its reputation.

The *Opah* is another of this genus, which sometimes arrives at an immense size. One was caught at Torbay in 1772, which weighed 140 pounds. It was in length four feet and a half; in breadth two feet and a quarter, though the greatest thickness was only four inches. The general colour was a

transparent scarlet varnish, spangled with silver spots of various sizes. The mouth of this fish is exceedingly small for its size.

The FLOUNDER is a very extensive genus, including those innumerable species which are known by the common term, flat fish, and which are distinguished from all others by one invariable characteristic, viz. that of having both the eyes on the same side of the head.

The *Hollibut* is by much the largest of the genus, weighing commonly from one hundred to three hundred pounds. The hollibut is the most voracious of fishes, and has been known to swallow even the lead which seamen make use of for the purpose of sounding the depth. Its back is a dusky colour, its belly pure white. The flesh is very coarse and indifferent food. It is the narrowest fish in proportion to its length of any of this genus, except the sole.

The *Plaise* is sometimes known to weigh fifteen pounds. It is easily distinguished by the upper part of the body, which is dusky, being marked with large orange-coloured spots.

The *Flounder*, or *Fluke*, may be easily known from every other fish of this genus, by a row of sharp small spines, which surround its upper sides, and are just placed where the fins join to the body. It frequents our rivers, where it may be be termed a fish of passage, generally repairing thither at certain seasons to deposit its spawn. The back is of a pale brown, sometimes marked with a few obscure spots.

The *Dab* is found often along with the flounder, but is less common. It is smaller than either the plaise or the flounder, but is more esteemed as food. The back is generally of a uniform brown colour, sometimes clouded with a darker. It is in season from February to April.

The *Sole* is a well-known fish, which sometimes is found of the weight of six or seven pounds. On the northern coasts it is much smaller.

The *smooth Sole*, or *Lanthern Fish*, is almost peculiar to the coast of Cornwall. It is thin, white, and almost pellucid.

The *Turbot* is the most celebrated of all this genus, and has been known to grow to the weight of thirty pounds. The turbot fishery is of considerable importance to the Dutch. The mode of conducting it is the same with that employed for taking the ray, and has already been minutely described.

The *Pearl* resembles the turbot, but is inferior to it as food; its back is of a deep brown, marked with spots of a dirty yellow.

The *Whiff* resembles the hollibut, but is smaller.

The GILT-HEAD takes its name from its predominant colour, the forehead and sides resembling gold, though the latter are tinged with brown. It has but one back fin, which reaches the whole length of the body. In form it in some degree resembles the bream. It is found in deep waters, on bold rocky shores; it subsists chiefly on shell-fish, and some of the species grow to the weight of ten pounds.

Besides the *lunated*, which is the most common, and takes its name from a semi-lunar gold spot under the eyes, there are the *red* and the *toothed gilt-heads*, the last of which are distinguished by two long and slender canine teeth on each side.

There is a fish in some degree resembling the preceding, which is called by naturalists, by way of eminence, the DORADO, but which the sailors erroneously term the dolphin; it is chiefly found in the tropical climates; and is at once the most active and the most beautiful of the finny race. It is about six feet long; the back all over enamelled with spots of a bluish green and silver; the tail and fins of a gold colour; and all have a brilliancy of tint, that nothing but Nature's pencil can attain: the eyes are placed on each side of the head, large and beautiful, surrounded with circles of shining gold. In the seas where they are found, these fish are always in motion, and play round ships in full sail, with ease and security: for ever either pursuing or pursued, they are seen continually in a state of warfare; either defending themselves against the shark, or darting after the smaller fishes.

Above all others, the *Flying-fish* most abounds in these seas; and as it is a small animal, seldom growing above the size of a herring, it is chiefly sought by the dorado. Nature has furnished each respectively with the powers of pursuit and evasion. The dorado being above six feet long, yet not thicker than a salmon, and furnished with a full complement of fins, cuts its way through the water, with amazing rapidity; on the other hand, the flying-fish is furnished with two pair of fins, longer than the body, and these also moved by a stronger set of muscles than any other. This equality of power seems to furnish one of the most entertaining spectacles those seas can exhibit. The

efforts to seize on the one side, and the arts of escaping on the other, are perfectly amusing. The dorado is seen, upon this occasion, darting after its prey, which will not leave the water, while it has the advantage of swimming, in the beginning of the chase. But, like a hunted hare, being tired at last, it then has recourse to another expedient for safety by flight. The long fins, which began to grow useless in the water, are now exerted in a different manner, and different direction to that in which they were employed in swimming: by this means the timid little animal rises from the water, and flutters over its surface, for two or three hundred yards, till the muscles employed in moving the wings are enfeebled by that particular manner of exertion. By this time, however, they have acquired a fresh power of renewing their efforts in the water, and the animal is capable of proceeding with some velocity by swimming: still, however, the active enemy keeps it in view, and drives it again from the deep; till at length, the poor little creature is seen to dart to shorter distances, to flutter with greater effort, and to drop down at last into the mouth of its fierce pursuer. But not the dorado alone, all animated nature seems combined against this little fish, which seems possessed of double powers, only to be subject to greater dangers. For though it should escape from its enemies of the deep, yet the tropic bird, and the albatross, are for ever upon the wing to seize it. Thus pursued in either element, it sometimes seeks refuge from a new enemy; and it is not unfrequent for whole shoals of them to fall on ship-board, where they furnish man with an object of useless curiosity.

The WRASSE includes several species, the most common of which is the *Ancient Wrasse*, or *Old Wife*. It is of a clumsy shape not unlike a carp, and covered with large scales; it has one large back fin, which consists of sixteen sharp spiny rays, and nine soft ones. The tail consists of fourteen soft branching rays, and is rounded at the end. They vary greatly in colour, some being of a dirty red, and others beautifully striped. They are generally found in deep water, adjacent to the rocks, and feed upon shell-fish. They grow to the weight of four or five pounds.

Besides these species, Mr. Pennant has enumerated the *Ballan*, the *bimaculated*, *trimaculated*, *striped*, *and gibbous Wrasse*, the *Goldsinny*, the *Scomber*, and the *Cook*.

The PERCH of Aristotle and Aufonius, is the same with that of the moderns. That mentioned by Oppian, Pliny, and

Athenæus, is a sea-fish, probably of the *Labrus* or *Sparus* kind, being enumerated by them among some congenerous species. Our perch was much esteemed by the Romans.

Nor is it less admired at present, as a firm and delicate fish; the Dutch, indeed, are particularly fond of it when made into a dish called water souchy.

It is a gregarious fish, and loves deep holes and gentle streams. It is a most voracious fish, and eager biter; if the angler meets with a shoal of them, he is sure of taking every one.

It is a common notion that the pike will not attack this fish, being fearful of the spiny fins which the perch erects on the approach of the former. This may be true in respect to large fish; but it is well known the small ones are the most tempting bait that can be laid for the pike.

The perch is a fish very tenacious of life: we have known them carried near sixty miles in dry straw, and yet survive the journey.

These fish seldom grow to a large size: we once heard of one that was taken in the Serpentine river, Hyde Park, that weighed nine pounds; but that is very uncommon.

The body is deep; the scales very rough; the back much arched; side-line near the back.

The irides golden; the teeth small, disposed in the jaws, and on the roof of the mouth; the edges of the covers of the gills serrated; on the lower end of the largest is a sharp spine.

The first dorsal fin consists of fourteen strong spiny rays; the second of sixteen soft ones; the pectoral fins are transparent, and consist of fourteen rays; the ventral of six; the anal of eleven.

The tail is a little forked.

The colours are beautiful; the back, and part of th sides being of a deep green, marked with five broad black bars pointing downwards; the belly is white, tinged with red; the ventral fins of a rich scarlet; the anal fins and tail of the same colour, but rather paler.

In a lake called Llyn Raithlyn, in Merionethshire, is a very singular variety of perch; the back is quite hunched, and the lower part of the back-bone, next the tail, strangely distorted; in colour, and in other respects, it resembles the common kind, which are as numerous in the lake as these deformed fish. They are not peculiar to this water; for Linnæus takes notice of a similar variety found at Fahlun, in his own country. We have also heard that it is to be met with in the Thames, near Marlow.

The *Basse* is a larger and coarser kind of perch, which sometimes grows to the weight of fifteen pounds. It is, however, of rather a longer make, more resembling that of a salmon. The back is dusky, tinged with blue, and the belly white. The *Sea Perch* grows to about a foot long. The head is large and deformed, and covered with sharp spines. The colour is red, with a black spot on the covers of the gills, and some transverse dusky lines on the sides.

The *Ruffe* is a well known fish. It is armed with spines like the perch, but has only one back fin. It is of a dirty green, and almost transparent, and spotted with black. It is found in shoals in the deep parts of running streams, and is esteemed good food. It seldom exceeds six inches in length.

The STICKLE-BACK is a well known little fish. In the fens of Lincolnshire they are found in such numbers, that they are used to manure the land. There are three species, the common, or *three spined*, the *ten spined*, and the *fifteen spined*. The two first seldom reach the length of two inches, the latter sometimes grows to that of six, and is found in the sea only.

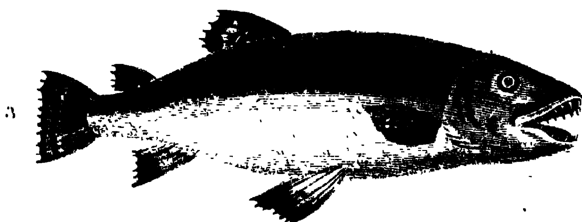
The MACKEREL genus is distinguished by a number of small fins, between the back fin and the tail. The common mackerel is a beautiful fish, which is well known for the seasonable visits which it pays to our shores. Nothing can equal the brilliancy of its colours, which are a fine green, varied with blue and black, and which death indeed impairs, but cannot totally destroy.

The *Mackerel*, as well as the *Haddock* and the *Whiting*, are thought, by some, to be driven upon our coasts rather by their fears than their appetites; and it is to the pursuit of the larger fishes, we owe their welcome visits. It is much more probable, that they come for that food which is found in more plenty near the sea-shore than farther out at sea. The limits of a shoal are precisely known; for if the fishermen put down their lines at the distance of more than three miles from the shore, they catch nothing but dog-fish: a proof that the haddock is not there.

The *Tunny* retains not only the character, but the habits of the mackerel. They resort in vast shoals to the Mediterranean at certain seasons, and, from the earliest periods of history, have constituted a considerable branch of commerce there. The tunny, however, differs greatly from the mack-









1. *Mackrel.* — 2. *Tunny.* — 3. *Salmon.* — 4. *Trout.*

erel in size; one of which Mr. Pennant saw at Inverary that weighed 460 pounds. It was seven feet ten inches in length, and the circumference in the largest part was five feet seven, and near the tail only one foot six. The pieces, when fresh cut, appear like raw beef, but when boiled turn pale, and have something of the flavour of salmon.

The *Scad*, or *horse mackerel*, is much smaller than the tunny. It is distinguished by a large black spot on the covers of the gills, and by the second back fin reaching almost to the tail. It is tolerable food.

The Surmulet has the body slender; the head almost four-cornered; the fin covering the gills with three spines; some of these have beards; it was a fish highly prized by the Romans, and is still considered as a very great delicacy.

The Gurnard genus is known by a slender body, the head nearly four-cornered, and covered with a bony coat; the fin covering the gills with seven spines: the pectoral and ventral fins, strengthened with additional muscles and bones, and very large for the animal's size.

Of the gurnard Mr. Pennant has remarked five species. The *grey*, the *red*, the *piper*, the *sapphirine*, and the *streaked*. They have all nearly the same nature and manners. They are taken in deep water, with no other bait than a red rag, and are esteemed good food.

The fourth division of the spinous fibres consists of the Abdominal, or those which have the *ventral fins behind the pectoral*, that is nearer the tail, as in the salmon.

The Loach is the first genus which is noticed in this division, and is a well known little fish, which never exceeds four inches in length. It is distinguished by an oblong body; almost equally broad throughout; the head small, a little elongated: the eyes in the hinder part of the head; the fin covering the gills from four to six rays; the covers of the gills closed below.

The Salmon is too well known to require a description. It is entirely a northern fish, being found both at Greenland and Kamschatka, but never so far south as the Mediterranean. About the latter end of the year the salmon begin to press up the rivers to deposit their spawn, which lies buried in the sand till spring, if not disturbed by the floods, or devoured by other fishes. About March the young

ones begin to appear, and about the beginning of May the river is full of the salmon fry, which are then four or five inches long, and gradually proceed to the sea. About the middle of June the earliest fry begin to return again from the sea, and are then from twelve to fourteen inches long. The growth of this fish is so extraordinary, that a young salmon being taken at Warrington, and which weighed seven pounds on the 7th of February, being marked with a scissars on the back fin, was again taken on the 17th of March following, and was then found to weigh seventeen pounds and a half.

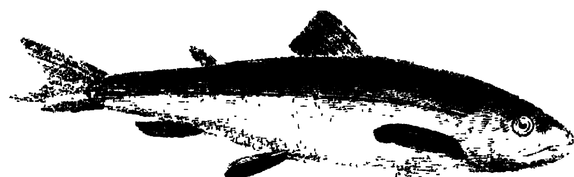
The *Sea-trout or Salmon-trout*, migrates like the salmon up several of our rivers, spawns, and returns to the sea. The shape is thicker than the common trout. The head and back are dusky, with a gloss of blue and green, and the sides, as far as the lateral line, are marked with large irregular spots of black. The flesh, when boiled, is red, and resembles that of the salmon in taste.

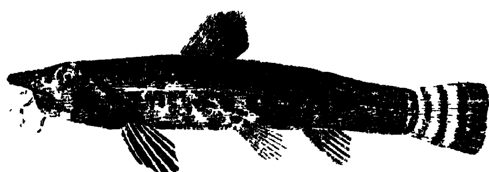
The *White Trout* appears much of the same nature, and migrates out of the sea into the river Esk, in Cumberland, from July to September.

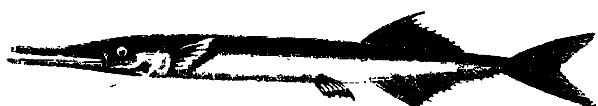
The *Samlet* is considered by Mr. Pennant as a distinct species, and not as the fry of the salmon, as some persons have supposed. In this case it must be considered as the smallest of the trout genus, from which, however, it materially differs. It seldom exceeds six or seven inches in length.

The *Trout*. It is a matter of surprise that this common fish has escaped the notice of all the ancients, except Ausonius. It is also singular, that so delicate a species should be neglected at a time when the folly of the table was at its height; and that the epicures should overlook a fish that is found in such quantities in the lakes of their neighbourhood, when they ransacked the universe for dainties. The milts of *murænæ* were brought from one place; the livers of *scari* from another: and oysters even from so remote a spot as Sandwich: but there was, and is still, a fashion in the article of good living. The Romans seem to have despised the trout, the piper, and the doree; and we believe Mr. Quin himself would have resigned the rich paps of a pregnant sow, the heels of camels, and the tongues of *flamingos*, though dressed by Heliogabalus's cooks, for a good jowl of salmon with lobster sauce.

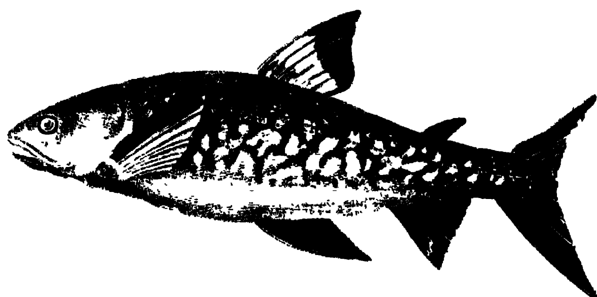
The colours of the trout, and its spots, vary greatly in different waters, and in different seasons; yet each may be reduced to one species. In Llyndivi, a lake in South











1. Samlet. 2. Loach. 3. Gar Pike 4. Pike 5. Charr.

Wales, are trouts called *coch-y-dail;* marked with red and black spots as big as sixpences; others unspotted, and of a reddish hue, that sometimes weigh near ten pounds, but are bad tasted.

In Lough Neagh, in Ireland, trouts are called *buddaghs,* which sometimes weigh thirty pounds.

Trouts (probably of the same species) are also taken in Ulswater, a lake in Cumberland, of a much superior size to those of Lough Neagh. These are supposed to be the same with the trout of the lake of Geneva.

In the river Eyneon, not far from Machyntleth, in Merionethshire, and in one of the Snowden lakes, are found a variety of trout, which are naturally deformed, having a strange crookedness near the tail, resembling that of the perch before described.

The stomachs of the common trouts are uncommonly thick and muscular. They feed on the shell-fish of lakes and rivers, as well as on the small fish. They likewise take into their stomachs gravel, or small stones, to assist in comminuting the testaceous parts of their food. The trouts of certain lakes in Ireland, such as those of the province of Galway, and some others, are remarkable for the great thickness of their stomachs, which, from some slight resemblance to the organ of digestion in birds, have been called gizzards; the Irish name the species that has them, *Gillaroo* trouts. These stomachs are sometimes served up to table, under the former appellation. It does not, however, appear, that the extraordinary strength of stomach in the Irish fish should give any suspicion that it is a distinct species; the nature of the waters might encrease the thickness; or the superior quality of shell-fish, which may more frequently call for the use of its comminuting powers than those of our trouts, might occasion this difference.

Trouts are most voracious fish, and afford excellent diversion to the angler; the passion for the sport of angling is so great in the neighbourhood of London, that the liberty of fishing in some of the streams in the adjacent countries is purchased at the rate of ten pounds per annum.

These fish shift their quarters to spawn, and, like salmon, make up towards the heads of rivers to deposit their roes.

The *Charr* is found in the lakes of the north, and in those of the mountainous parts of Europe. The inhabitants of Westmoreland distinguish them into different kinds, according to their colours, but they appear to be varieties rather than different species. These fish seldom exceed twelve inches in length. The head, back, dorsal fin, and tail, are

dusky blue, and the sides are marked with a number of bright red spots. They are esteemed as a very delicate food.

The *Grayling* is another of this genus, which haunts clear and rapid streams. It is of an elegant form, less deep than a trout. It is in general of a fine silvery grey, but when just taken it is varied slightly with blue and gold. The scales are large; the first dorsal fin consists of twenty-one rays; this fin is spotted, all the rest are plain: the tail is much forked. The largest that has been heard of was taken near Ludlow; it was half a yard long, and weighed four pounds six ounces.

The *Smelt* inhabits the northern seas, and is never found so far south as the Mediterranean. Its name is supposed to be a contraction of "smell it," from its very agreeable smell. Its form is very elegant, and the skin is almost transparent. The largest we have heard of was thirteen inches long, and weighed half a pound.

The *Gwiniad* is found in the lakes of several of the alpine parts of Europe. It is a gregarious fish, and approaches the shores in vast shoals in spring and summer. A Hulsewater fisherman, in 1775, took near 8000 at one draught. It is of an insipid taste, and must be eaten soon. The back is arched and glossed with blue and purple, the sides are of a silvery cast, tinged with gold. The mouth is small, and without teeth. It is about eleven inches long.

The PIKE is common in most of the lakes of Europe, but the largest are those taken in Lapland, which, according to Schæffer, are sometimes eight feet long. They are taken there in great abundance, dried, and exported for sale. The largest fish of this kind which we have ever heard of in England, weighed thirty-five pounds.

According to the common saying, these fish were introduced into England in the reign of Henry VIII. in 1537. They were so rare, that a pike was sold for double the price of a house-lamb, in February, and a pikerel for more than a fat capon.

All writers who treat of this species bring instances of its vast voraciousness. We have known one that was choaked by attempting to swallow one of its own species that proved too large a morsel. Yet its jaws are very loosely connected; and have on each side an additional bone like the jaw of a viper; which renders them capable of great distention when it swallows its prey. It does not confine itself to feed on fish and frogs, it will devour the water-rat, and draw down the young ducks as they are swimming about.

At the Marquis of Stafford's canal at Trentham, a pike seized the head of a swan, as she was feeding under water, and gorged so much of it as killed them both. The servants, perceiving the swan with its head under water for a longer time than usual, took the boat, and found both swan and pike dead.

But there are instances of its fierceness still more surprising, and which, indeed, border a little on the marvellous. Gessner relates, that a famished pike in the Rhone seized on the lips of a mule, that was brought to water, and that the beast drew the fish out before it could disengage itself; that people have been bit by these voracious creatures while they were washing their legs, and that they will even contend with the otter for its prey, and endeavour to force it out of its mouth.

Small fish shew the same uneasiness and detestation at the presence of this tyrant, as the little birds do at the sight of the hawk or owl. When the pike lies dormant near the surface (as is frequently the case), the lesser fish are often observed to swim around it in vast numbers, and in great anxiety. Pike are often haltered in a noose, and taken while they lie thus asleep, as they are often found in the ditches near the Thames, in the month of May.

In the shallow water of the Lincolnshire fens, they are frequently taken in a manner peculiar, we believe, to that country, and the isle of Ceylon. The fishermen make use of what is called a crown-net, which is no more than a hemispherical basket, open at top and bottom. He stands at the end of one of the little fen-boats, and frequently puts his basket down to the bottom of the water, then, poking a stick into it, discovers whether he has any booty by the striking of the fish; vast numbers of pike are taken in this manner.

The longevity of this fish is very remarkable, if we may credit the accounts given of it. Rzaczynski tells us of one that was ninety years old; but Gessner relates, that in the year 1497, a pike was taken near Hailbrun, in Suabia, with a brazen ring affixed to it, on which were these words in Greek characters: *I am the fish which was first of all put into this lake by the hands of the governor of the universe,* Frederick *the second, the 5th of October*, 1230: so that the former must have been an infant to this Methusalem of a fish.

Pike spawn in March or April, according to the coldness or the warmth of the weather. When they are in high sea-

son, their colours are very fine, being green, spotted with bright yellow; and the gills are of a most vivid and full red. When out of season, the green changes to grey and the yellow spots turn pale.

The head is very flat; the upper jaw broad, and is shorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures.

The teeth are very sharp, disposed not only in the front of the upper jaw, but in both sides of the lower, in the roof of the mouth, and often the tongue. The slit of the mouth, or the gape, is very wide; the eyes small.

The dorsal fin is placed very low on the back, and consists of twenty-one rays; the pectoral of fifteen; the ventral of eleven; the anal of eighteen. The tail is bifurcated.

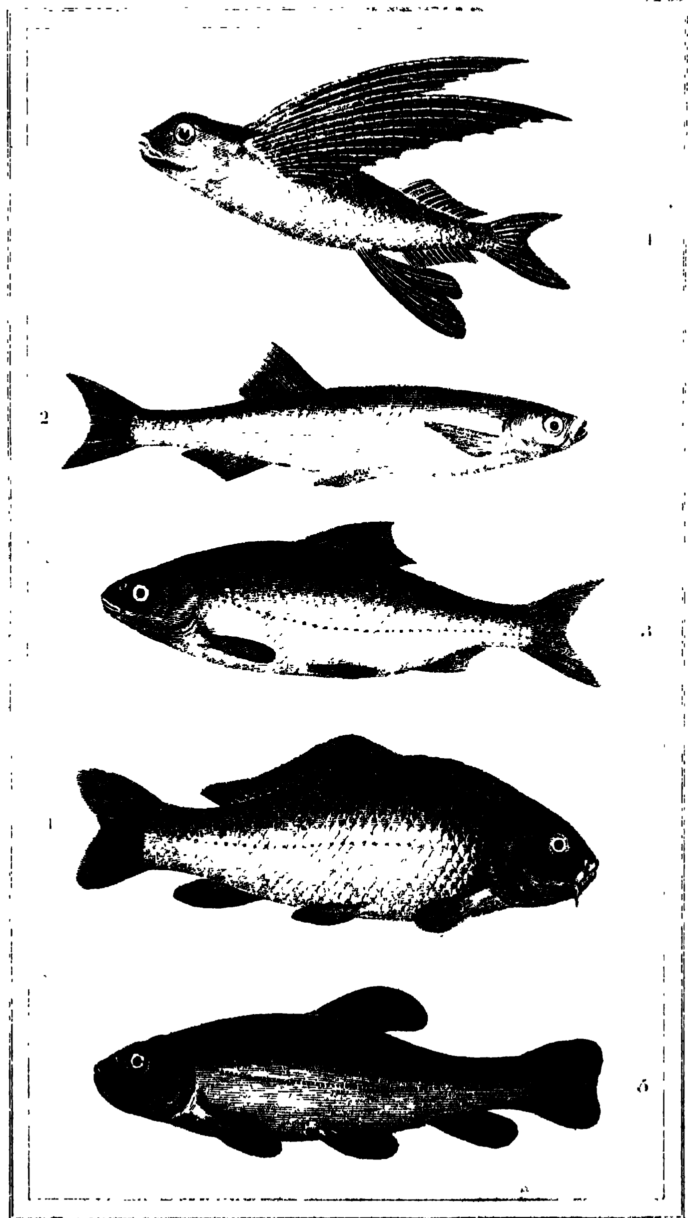
The *Gar-pike* or *Sea-needle*, comes in shoals on our coasts, and precedes the mackerel. It resembles that fish in flavour, but is distinguished from all of the kind by the backbone, which turns a fine light green when the fish is boiled. It sometimes grows to the length of three feet. The jaws are exceeding long, slender, and pointed, and the edges of them are armed with numbers of short slender teeth. It is sometimes known by the name of the *horn-fish*. The tail is forked.

The *Saury-pike* is about eleven inches long, and its jaws are protracted like those of the sea-needle. The body also resembles that of an eel, but like the mackerel, it has a number of small fins near the tail, which is forked.

The ARGENTINE is a small fish between two and three inches long. The body is compressed, and almost of an equal breadth to the anal fin. The back is of a dusky green, the sides and covers of the gills as if planted with silver. It is taken in the sea.

The ATHERINE is common in the sea near Southampton, where it is called a smelt. It never deserts the place, and is constantly taken, except in hard frost. It is about four inches in length, the back straight, the belly a little protuberant. Its colour is silvery, tinged with yellow, and below the side-line is a row of black spots. It is semi-pellucid.

The MULLET was formerly much celebrated as a treat for the epicure, and frequent allusionss to it are found in the ancient satyrists. It is a fish of an elegant form; is generally found by the sea-shores, where it roots like a hog



1. Flying Fish. — 2. Dace. — 3. Roach. — 4. Carp. — 5. Tench.

in the sand or mud, and it is so active, that it frequently escapes, by leaping out of the fishermen's nets. The head is almost square, and is flat at the top. It has no teeth, only in the upper lip is a small roughness. The tail is much forked. The colour of the back is dusky, marked with blue and green. The sides silvery, marked with dusky lines, reaching from the head to the tail. The belly is silvery.

Of the FLYING FISH so much has been said under the article dorado, that it is only necessary in this place to add a short description of it.

The body of this fish is oblong; the head is almost three-cornered; the fin covering the gills with ten rays; the pectoral fins placed high, and as long as the whole body; the back fin at the extremity of the back. The tail is bifurcated.

The HERRING is a fish too well known to require a description. The genus includes, however, some species less generally diffused, such as the pilchard, the shad, the anchovy, &c.

The *Pilchard* is thicker ana rounder than the herring. The nose is shorter in proportion, and turns up. The back is more elevated, the belly less sharp. The back fin of the pilchard is placed exactly in the centre of gravity, so that when taken up by it, the fish exactly preserves an equilibrium, whereas that of the herring dips at the head. The scales of the pilchard adhere very closely, whereas those of the herring very easily drop off. The pilchard is in general less than the herring, and is fatter and fuller of oil.

Of all the migrating fish, the *herring* and the *pilchard* take the most adventurous voyages. Herrings are found in the greatest abundance in the highest northern latitudes. In those inaccessible seas, that are covered with ice for a great part of the year, the herring and pilchard find a quiet and sure retreat from all their numerous enemies: thither neither man, nor their still more destructive enemy, the fin-fish, or the cachalot, dares to pursue them. The quantity of insect food which those seas supply, is very great; whence, in that remote situation, defended by the icy rigour of the climate, they live at ease, and multiply beyond expression. From this most desirable retreat Anderson supposes they would never depart, but that their numbers render it necessary for them to migrate: and, as bees from a hive, they are compelled to seek for other retreats.

For this reason, the great colony is seen to set out from the icy sea about the middle of winter; composed of such

numbers, that if all the men in the world were to be loaded with herrings, they would not carry a thousandth part away. But they no sooner leave their retreats, but millions of enemies appear to thin their squadrons. The fin-fish and the cachalot swallow barrels at a yawn; the porpesse, the grampus, the shark, and the whole numerous tribe of dog-fish, find them an easy prey, and desist from making war upon each other: but still more, the unnumbered flocks of sea-fowl, that chiefly inhabit near the pole, watch the outset of their dangerous migration, and spread extensive ruin.

In this exigence, the defenceless emigrants find no other safety, but by crowding closer together, and leaving to the outmost bands the danger of being the first devoured; thus like sheep when frightened, that always run together in a body, and each finding some protection in being but one of many that are equally liable to invasion, they are seen to separate into shoals, one body of which moves to the west, and pours down along the coast of America, as far south as Carolina, and but seldom farther. In Chesapeak Bay, the annual inundation of these fish is so great, that they cover the shores in such quantities as to become a nuisance. Those that hold more to the east, and come down towards Europe, endeavour to save themselves from their merciless pursuers, by approaching the first shore they can find; and that which first offers in their descent is the coast of Iceland, in the beginning of March. Upon their arrival on that coast, their phalanx, which has already suffered considerable diminutions, is, nevertheless, of amazing extent, depth, and closeness, covering an extent of shore as large as the island itself. The whole water seems alive; and is seen so black with them at a great distance, that the number seems inexhaustible.

That body which comes upon our coasts begins to appear off the Shetland Isles in April. These are the forerunners of the grand shoal which descends in June; while its arrival is easily announced by the number of its greedy attendants, the gannet, the gull, the shark, and the porpesse. When the main body is arrived, its breadth and depth is such, as to alter the very appearance of the ocean. It is divided into distinct columns, of five or six miles in length, and three or four broad; while the water before them curls up, as if forced out of its bed. Sometimes they sink for the space of ten or fifteen minutes, then rise again to the surface; and, in bright weather, reflect a variety of splendid colours, like a field bespangled with purple, gold and azure. The fishermen are ready prepared to give them a proper

reception; and, by nets made for the occasion, they take sometimes above two thousand barrels at a single draught.

The *Sprat* is now generally allowed not to be the fry of the herring, as, from its great resemblance, was formerly supposed. The back fin of the sprat is more remote from the nose than that of the herring; but a principal distinction is, that the belly of both the herring and pilchard is quite smooth, whereas that of the sprat is serrated. The herring has fifty-six vertebræ, the sprat only forty-eight. The sprat seldom exceeds five inches in length.

The *Anchovy* is about six inches and a half in length. The body is slender, but thicker in proportion than the herring. The scales are large, and easily fall off. The back is green, and semipellucid, the sides and belly silvery; and the tail forked.

The *Shad* is taken in many rivers; those of the Severn are most esteemed, and are distinguished by the London fishmongers by the French name of Alosse. The Thames shad is a very insipid coarse fish, and, when it vistts the Severn, is called the *twaite;* it is held in great disrepute.

The difference between the two kinds is as follows:— The true *shad* weighs from four to eight pounds; the *twaite* from half a pound to two. The twaite may also be known from a small shad, by having one or more black spots on the sides, when it has only one, it is always near the gill.

The shad in form rather resembles the herring, but is larger and thinner, or more compressed in proportion. The head slopes considerably from the back; and the under jaw is longer than the upper.

The Carp is a genus, which besides the fish which bears that name, includes several others, well known to anglers, viz. the barbel, the gudgeon, the crucian, the bream, the tench, the roach, dace, &c.

The *carp* is one of the naturalized fish in England, having been introduced there by Leonard Maschal, about the year 1514, to whom the English were also indebted for that excellent apple the pippin. The many good things which the island wanted before that period are enumerated in this old distich:

"Turkies, carp, hops, pickerel, and beer,
Came into England all in one year."

As to the two last articles we have some doubts, the others we believe to be true. Russia wants these fish at this

day; Sweden has them only in the ponds of the people of fashion; Polish Prusia is the chief seat of the carp; they abound in the rivers and lakes of that country, particularly in the Frisch in Curisch-haff, where they are taken of a vast size. They are there a great article of commerce, and sent in well-boats to Sweden and Russia. The merchants purchase them out of the waters of the noblesse of the country, who draw a good revenue from this article. Neither are there wanting among our gentry instances of some who make good profit of their ponds.

The ancients do not separate the carp from the sea-fish. We are credibly informed that they are sometimes found in the harbour of Dantzic, between the town and a small place called Hela.

Carp are very long lived. Gessner brings an instance of one that was an hundred years old. They also grow to a very great size. On our own knowledge we can speak of none that exceed twenty pounds in weight; but Jovius says, that they were sometimes taken in the Lacus Larius (the Lago di Como) of two hundred pounds weight; and Rzaczynski mentions others taken in the Dneister that were five feet in length.

The carp is a prodigious breeder: its quantity of roe has been found so great, that when taken out and weighed against the fish itself, the former has been found to preponderate. From the spawn of this fish caviare is made for the Jews, who hold the sturgeon in abhorrence.

These fish are extremely cunning, and on that account are by some styled the *river fox*. They will sometimes leap over the nets, and escape that way; at others, will immerse themselves so deep in the mud, as to let the net pass over them. They are also very shy of taking a bait; yet at the spawning time they are so simple, as to suffer themselves to be tickled, and caught by any body that will attempt it.

This fish is apt to mix its milt with the roe of other fish, from which is produced a spurious breed; we have seen the offspring of the carp and tench, which bore the greatest resemblance to the first: have also heard of the same mixture between the carp and the bream.

The carp is of a thick shape; the scales very large, and when in best seasom of a fine gilded hue.

The jaws are of equal length; there are two teeth in the jaws, or on the tongue; but at the entrance of the gullet, above and below, are certain bones that act on each other and comminute the food before it passes down.

On each side of the mouth is a single beard; above those on each side another, but shorter; the dorsal fin extends far towards the tail, which is a little bifurcated; the third ray of the dorsal fin is very strong, and armed with sharp teeth, pointing downwards; the third ray of the anal fin is constructed in the same manner.

The *Barbel* was so extremely coarse, as to be overlooked by the ancients till the time of Ausonius, and what he says is no panegyric on it; for he lets us know it loves deep waters, and, that when it grows old, it was not absolutely bad.

It frequents the still and deep parts of rivers, and lives in society, rooting like swine with their noses in the soft banks. It is so tame as to suffer itself to be taken with the hand; and people have been known to take numbers by diving for them. In summer they move about during night in search of food, but towards autumn, and during winter, confine themselves to the deepest holes.

They are the worst and coarsest of fresh-water fish, and seldom eaten but by the poorer sort of people, who sometimes boil them with a bit of bacon, to give them a relish. The roe is very noxious, affecting those who unwarily eat of it with a nausea, vomiting, purging, and a slight swelling.

It is sometimes found of the length of three feet, and eighteen pounds in weight: it is of a long and rounded form: the scales not large.

Its head is smooth; the nostrils placed near the eyes; the mouth is placed below; on each corner is a single beard, and another on each side the nose.

The dorsal fin is armed with a remarkably strong spine, sharply serrated, with which it can inflict a very severe wound on the incautious handler, and even do much damage to the nets.

The pectoral fins are of a pale brown colour; the ventral and anal tipped with yellow; the tail a little bifurcated, and of a deep purple; the side line is straight.

The scales are of a pale gold colour, edged with black; the belly is white.

The *Tench* underwent the same fate with the barbel, in respect to the notice taken of it by the early writers: and even Ausonius, who first mentions it, treats it with such disrespect, as evinces the great capriciousness of taste; for that fish, which at present is held in such good repute, was in his days the repast only of the canaille.

It has been by some called the Physician of the fish, and the slime so healing, that the wounded apply it as a styptic.

Whatever virtue its slime may have to the inhabitants of the water, we will not vouch for, but its flesh is a wholesome and delicious food to those of the earth. The Germans are of a different opinion. By way of contempt they call it shoemaker. Gessner even says, that it is insipid and unwholesome.

It does not commonly exceed four or five pounds in weight, but we have heard of one that weighed ten pounds; Salvianus speaks of some that arrived at twenty pounds.

They love still waters, and are rarely found in rivers; they are very foolish, and easily caught.

The tench is thick and short in proportion to its length; the scales are very small, and covered with slime.

The irides are red; there is sometimes, but not always, a small beard at each corner of the mouth.

The colour of the back is dusky; the dorsal and ventral fins of the same colour; the head, sides and belly, of a greenish cast, most beautifully mixed with gold, which is in its greatest splendour when the fish is in the highest season.

The tail is quite even at the end, and very broad.

Aristotle mentions the *Gudgeon* in two places, once as a river fish, again as a species that was gregarious; and in a third place he describes it as a sea fish.

This fish is generally found in gentle streams, and is of a small size; those few, however, that are caught in the Kennet and Cole, are three times the weight of those taken elsewhere. The largest we ever heard of was taken near Uxbridge, and weighed half a pound.

They bite eagerly, and are assembled by raking the bed of the river; to this spot they immediately crowd in shoals, expecting food from this disturbance.

The shape of the body is thick and round; the irides tinged with red; the gill covers with green and silver; the lower jaw is shorter than the upper; at each corner of the mouth is a single beard; the back olive, spotted with black; the side-line straight; the sides beneath that silvery; the belly white.

The tail is forked; that, as well as the dorsal fin is spotted with black.

The *Bream* is an inhabitant of lakes, or the deep parts of still rivers. It is a fish that is very little esteemed, being extremely insipid.

It is extremely deep, and thin in proportion to its length. The back rises much, and is very sharp at the top. The head and mouth are small; on some we examined in the

spring, were abundance of minute whitish tubercles, an accident which Pliny seems to have observed befals the fish of the Lago Maggiore, and Lago di Como. The scales are very large; the sides flat and thin.

The dorsal fin has eleven rays, the second of which is the longest; that fin, as well as all the rest, are of a dusky colour; the back of the same hue; the sides yellowish

The tail is very large, and of the form of a crescent.

The *Rud* is found in the Charwell, near Oxford, in the Fens near Holderness. The body is extremely deep, like that of the bream, but much thicker. The head is small; the back vastly arched; the scales very large. The back is of an olive colour, the sides and belly gold; the ventral and anal fins, and the tail of a deep red. It appears to be the same fish with the *shallow* of the Cam.

The *Crucian* is common in many of the fish-ponds aoout London, and other parts of the south of England; but we believe is not a native fish.

It is very deep and thick; the back is much arched; the dorsal fin consists of nineteen rays: the two first strong and serrated. The pectoral fins have (each) thirteen rays; the ventral nine; the anal seven or eight; the lateral line parallel with the belly; the tail almost even at the end.

The colour of the fish in general is a deep yellow; the meat is coarse, and little esteemed.

"Sound as a *Roach*," is a proverb that appears to be but indifferently founded, that fish being not more distinguished for its vivacity than many others; yet it is used by the French as well as the English, who compare people of strong health to the *gordon*, or roach.

It is a common fish, found in many of our deep, still rivers, affecting, like the others of this genus, quiet waters. It is gregarious, keeping in large shoals. We have never seen them very large. Old Walton speaks of some that weighed two pounds. In a list of fish sold in the London markets, with the greatest weight of each, communicated to us by an intelligent fishmonger, there is mention of one whose weight was five pounds.

The roach is deep, but thin, and the back is much elevated, and sharply ridged; the scales large, and fall off very easily. Side-line bends much in the middle towards the belly.

The *Dace*, like the roach, is gregarious, haunts the same places, is a great breeder, very lively, and during summer is very fond of frolicking near the surface of the water. This fish, and the roach, are coarse and insipid meat.

Its head is small; the irides of a pale yellow; the body long and slender: its length seldom above ten inches, though in the above-mentioned list is an account of one that weighed a pound and a half; the scales smaller than those of the roach.

The back is varied with dusky, with a cast of a yellowish green; the sides and belly silvery; the dorsal fin dusky; the ventral, anal, and caudal fins red, but less than those of the former; the tail is very much forked.

The *Chub.* Salvianus imagines this fish to have been the *squalus* of the ancients, and grounds his opinion on a supposed error in a certain passage in Columella and Varro, where he would substitute the word *squalus* instead of *scarus.*

That the *scarus* was not our *chub*, is very evident; not only because the chub is entirely an inhabitant of fresh waters, but likewise it seems improbable that the Romans would give themselves any trouble about the worst of river fish; when they neglected the most delicious kinds; all their attention was directed towards those of the sea; the difficulty of procuring them to have been the criterion of their value, as is ever the case with effete luxury.

The chub is a very coarse fish, and full of bones; it frequents the deep holes of rivers, and during summer, commonly lies on the surface, beneath the shade of some tree or bush. It is a timid fish, sinking to the bottom on the least alarm, even at the passing of a shadow, but they will soon resume their situation. It feeds on worms, caterpillars, grasshoppers, beetles, and other coleopterous insects that happen to fall into the water; and it will even feed on cray-fish. This fish will rise to a fly.

This fish takes its name from its head, not only in the English. but in other languages; it is called *chub*, according to Skinner, from the old English, *cop*, a head; the French, in the same names call it *testard;* the Italians, *capitone.*

It does not grow to a large size; we have known some that weighed above five pounds; but Salvianus speaks of others that were eight or nine pounds in weight.

The body is oblong, rather round, and of a pretty equal thickness the greatest part of the way; the scales are large. The irides silvery; the cheeks of the same colour; the head and back of a deep dusky green; the sides silvery, but in the summer yellow; the belly white; the pectoral fins of a pale yellow; the ventral and anal fins red; the tail a little forked, of a brownish hue, but tinged with blue at the end

The *Bleak* is very common in many of our rivers, and keep together in large shoals. These fish seem at certain seasons to be in great agonies; they tumble about near the surface of the water, and are incapable of swimming far from the place, but in about two hours recover, and disappear. Fish thus affected, the Thames fishermen call *mad bleaks*. They seem to be troubled with a species of *gordius* or hair-worm, of the same kind with those which Aristotle says that the *ballerus* and *tillo* are infested with, which torments them, so that they rise to the surface of the water, and then die.

Artificial pearls are made with the scales of this fish, and we think of the dace. They are beaten into a fine powder, then diluted with water, and introduced into a thin glass bubble, which is afterwards filled with wax. The French were the inventors of this art. Dr. Lister tells us, that when he was at Paris, a certain artist used in one winter thirty hampers full of fish in this manufacture.

The bleak seldom exceeds five or six inches in length; their body is slender, greatly compressed sideways, not unlike that of the sprat.

The eyes are large; the irides of a pale yellow; the under jaw the largest; the lateral line crooked; the gills silvery; the back green; the sides and belly silvery; the fins pellucid; the scales fall off very easily; the tail much forked.

During the month of July there appear in the Thames, near Blackwall and Greenwich, innumerable multitudes of small fish, which are known to the Londoners by the name of *White Bait*. They are esteemed very delicious when fried with fine flour, and occasion, during the season, a vast resort of the lower order of epicures to the taverns contiguous to the places they are taken at.

There are various conjectures about this species, but all terminate in a supposition, that they are the fry of some fish, but few agree to which kind they owe their origin. Some attribute it to the shad, others to the sprat, the smelt, and the bleak. That they neither belong to the shad, nor the sprat, is evident from the number of branchiostegous rays, which in those are eight, in this only three. That they are not the young of the smelts is as clear, because they want the *pinna adiposa*, or rayless fin; and that they are not the offspring of the bleak is extremely probable, since we never heard of the white bait being found in any other river, notwithstanding the bleak is very common in several of the British streams: but as the white bait bears

a greater siniliarity to this fish than any other we have mentioned, we give it a place here as an appendage to the bleak, rather than form a distinct article of a fish which it is impossible to class with certainty.

It is evident that it is of the carp or *cyprinus* genus; it ha only three branchiostegous rays, and only one dorsal fin; and in respect to the form of the body, it is compressed like that of the bleak.

Its usual length is two inches; the under jaw is the longest; the irides silvery, the pupil black; the dorsal fin is placed nearer to the head than to the tail, and consists of about fourteen rays; the side line is strait; the tail is forked, the tips black.

The head, sides, and belly, are silvery; the back tinged with green.

The *Minow* is frequently found in many of our small gravelly streams, where they keep in shoals

The body is slender and smooth, the scales being extremely small. It seldom exceeds three inches in length.

The lateral line is of a golden colour; the back flat, and of a deep olive; the sides and belly vary greatly in different fish; in a few are of a rich crimson, in others blueish, in others white. The tail is forked, and marked near the base with a dusky spot.

The Gold Fish. These fish are now quite naturalized in Europe, and breed as freely in the open waters as the common carp.

They were first introduced into England about the year 1691, but were not generally known till 1728, when a great number were brought over, and presented first to Sir Matthew Dekker, and by him circulated round the neighbourhoood of London, whence they have been distributed to most parts of the country.

In China the most beautiful kinds are taken in a small lake in the province of Che-Kyang. Every person of fashion keeps them for amusement, either in porcelain vessels, or in the small basons that decorate the courts of the Chinese houses. The beauty of their colours, and their lively motions, give great entertainment, especially to the ladies, whose pleasures, by reason of the cruel policy of that country, are extremely limited.

In the form of the body they bear a great resemblance to a carp. They have been known in Europe to arrive at the length of eight inches; in their native place they are said to grow to the size of our largest herring.

The nostrils are tubular, and form a sort of appendages above the nose; the dorsal fin and the tail vary greatly in shape; the tail is naturally bifid, but in many is trifid, and in some even quadrifid; the anal fins are the strongest characters of this species, being placed not behind one another, like those of other fish, but opposite each other, like the ventral fins.

The colours vary greatly; some are marked with a fine blue, with brown, with bright silver; but the general predominant colour is gold, of a most amazing splendour; but their colours and form need not be dwelt on, since those who want opportunity of seeing the living fish, may survey them expressed in the most animated manner, in the works of Mr. George Edwards.

ANGLING is a very common amusement in these parts of the world, and is peculiarly agreeable to young persons of a contemplative turn. As this is the case, we shall present our readers with a short abstract of all that is necessary to be known on the subject, and which will prove of more real use to the young sportsman than the most elaborate treatise of angling.

Description of proper baits for fish, with a table of the different species, and the modes of catching them.

FLIES. 1. Stone-fly, found under hollow stones at the sides of rivers, is of a brown colour, with yellow streaks on the back and belly, has large wings, and is in season from April to July. 2. Green drake, found among stones by river sides, has a yellow body ribbed with green, is long and slender, with wings like a butterfly, his tail turns on his back, and from May to Midsummer is very good. 3. Oak-fly, found in the body of an old oak or ash, with its head downwards, is of a brown colour, and excellent from May to September. 4. Palmer-fly or worm, found on leaves of plants, is commonly called a *caterpillar*, and when it comes to a fly is excellent for trout. 5. Ant-fly, found in ant-hills from June to September. 6. The May-fly is to be found playing at the river-side, especially against rain. 7. The black fly is to be found upon every hawthorn after the buds are come off.

Pastes. 1. Take the blood of sheeps' hearts, and mix it with honey and flour worked to a proper consistence. 2. Take old cheese grated, a little butter sufficient to work it, and colour it with saffron; in winter use rusty bacon

instead of butter. 3. Crumbs of bread chewed or workea with honey or sugar, moistened with gum-ivy water. 4. Bread chewed, and worked in the hand till stiff.

Worms. 1. The earth-bob, found in sandy ground after ploughing, it is white, with a red head, and bigger than a gentle: another is found in heathy ground, with a blue head. Keep them in an earthen vessel well covered, and a sufficient quantity of the mould they harbour in. They are excellent from April to November. 2. Gentles, to be had from putrid flesh: let them lie in wheat-bran a few days before used. 3. Flag-worms, found in the roots of flags; they are of a pale yellow colour, are larger and thinner than a gentle, and must be scowered like them. 4. Cow-turd-bob, or clap-bait, found under a cow-turd from May to Michaelmas; it is like a gentle, but larger. Keep it in its native earth like the earth-bob. 5. Cadis worm, or cod-bait, found under loose stones in shallow rivers; they are yellow, bigger than a gentle, with a black or blue head, and are in season from April to July. Keep them in flannel bags. 6. Lob-worm, found in gardens; it is very large, and has a red head, a streak down the back, and a flat broad tail. 7. Marsh-worms, found in marshy ground; keep them in moss ten days before you use them: their colour is a blueish red, and are a good bait from March to Michaelmas. 8. Brandling red-worms or blood-worms found in rotten dung hills and tanners bark; they are small red worms, very good for all small fish, have sometimes a yellow tail, and are called *tag-tail.*

Fish and Insects. 1. Minow. 2. Gudgeon. 3. Roach. 4. Dace. 5. Smelt. 6. Yellow frog. 7. Snail Slit. 8. Grasshopper.

The fly is either *natural* or *artificial.*

I. *Natural* flies are innumerable. The most usual for this purpose are mentioned in the preceding page.

There are two ways of fishing with natural flies; either on the surface of the water, or a little underneath it.

In angling for chub, roach, or dace, move not your natural fly swiftly, when you see the fish make at it; but rather let it glide freely towards him with the stream; but if it be in a still and slow water, draw the fly slowly side-wise by him, which will make him eagerly pursue.

II. The *artificial* fly is seldom used but in blustering weather, when the waters ars so troubled by the winds, that the natural fly cannot be seen, nor rest upon them. Of this artificial fly, there are reckoned no less than twelve sorts, of which the following are the principal.

1. For March, the dun-fly; made of dun-wool, and the feathers of the partridge's wing; or the body made of black wool, and the feathers of a black drake. 2. For April the stone fly; the body made of black wool, dyed yellow under the wings and tail. 3. For the beginning of May, the ruddy fly; made of red wool, and bound about with black silk, with the feathers of a black capon hanging dangling on his sides next his tail. 4. For June, the greenish fly; the body made of black wool, with a yellow list on either side, the wings taken off the wings of a buzzard, bound with black broken hemp. 5. The moorish fly, the body made of duskish wool, and the wings of the blackish mail of a drake. 6. The tawny-fly, good till the middle of June; the body made of tawny wool, the wings made contrary one against the other; of the whitish mail of a white drake. 7. For July, the wasp-fly; the body made of black wool, cast about with yellow silk, and the wings of drakes' feathers. 8. The steel-fly, good in the middle of July; the body made with greenish wool, cast about with the feathers of a peacock's tail, and the wings made of those of the buzzard. 9. For August, the drake-fly; the body made with black wool, cast about with black silk; his wings of the mail of black drake, with a black head.

The best rules for artificial fly-fishing are,

1. To fish in a river somewhat disturbed with rain: or in a cloudy day, when the waters are moved by a gentle breeze: the south wind is best; and if the wind blow high, yet not so but that you may conveniently guard your tackle, the fish will rise in plain deeps; but if the wind be small, the best angling is in swift streams. 2. Keep as far from the water-side as may be; fish down the stream with the sun at your back, and touch not the water with your line. 3. Ever angle in clear rivers, with a small fly and slender wing: but in muddy places use a larger. 4. When, after rain, the water becomes brownish, use an orange fly; in a clear day, a light-coloured fly; a dark fly for dark waters, &c. 5. Let the line be twice as long as the rod, unless the river be encumbered with wood. 6. For every sort of fly, have several of the same, differing in colour, to suit with the different complexions of several waters and weathers. 7. Have a nimble eye, and active hand, to strike presently with the rising of the fish; or else he will be apt to spue out the hook. 8. Let the fly fall first into the water, and not the line, which will scare the fish. 9. In slow rivers, or still places, cast the fly across the river, and let it sink a little in the water, and draw it gently back with the current.

Salmon-flies should be made with their wings standing one behind the other, whether two or four. This fish delights in the gaudiest colours that can be; chiefly in the wings, which must be long, as the tail.

The above rules for fly-fishing chiefly respect *trout*, which indeed of all fish furnish the most excellent sport in this way.

Bait fishing is performed in two ways. 1st. On the ground with a long lead sinker, nicely fixed to the line, at about nine inches from the hook, which is necessary in strong running streams, or shallows, and is chiefly employed for trout; and then the angler feels the fish bite by his pulling at the line. 2dly. By means of a float, which is commonly made of cork or quill, and is proper in still or deep waters. In this case, it is absolutely necessary to plumb the depth, and adjust the hook to the proper depth according to the annexed table.

Much of the success in bottom or bait fishing depends on the angler having a quick eye and hand, and striking at the proper time. Roach, dace, bleak and gudgeons must be struck at the first nibble. Perch, tench and trout must be allowed certain time; and pike still longer, for those latter you must always fish with strong tackle and a bit of wire near the hook. In fishing for roach, dace, barbel, carp or bleak, you must always previously throw into the part of the river or pond where you mean to fish, a quantity of ground bait (bran and bread mixed into a paste and sunk with a stone or chandler's greaves) which brings the fish together and keeps them from wandering.

Happy England! (says an elegant writer) where the sea furnishes an abundant and luxurious repast, and the fresh waters an innocent and harmless pastime; where the angler, in cheerful solitude, strolls by the edge of the stream, and fears neither the coiled snake, nor the lurking crocodile; where he can retire at night, with his few trouts, to borrow the charming description of Old Walton, to some friendly cottage, where the landlady is good, and the daughter innocent and beautiful; where the room is cleanly, with lavender in the sheets, and twenty ballads stuck about the wall! There he can enjoy the company of a talkative brother sportsman, have his trouts dressed for supper, tells tails, sing old tunes, or make a catch! There he can talk of the wonders of nature, with learned admiration, or find some harmless sports to content him, and pass away a little time, without offence to God, or injury to man!

An Epitome of the whole art of Fishing, wherein is shewn (at one view) the harbours, seasons, and depths for catching all sorts of fish usually angled for; also the various baits for each, so digested, as to contain the essence of all the treatises ever written on the subject, exempt from the superfluities which tend more to perplex than instruct.

Names.	Where found.	Season.	Time to ang.	Depth from ground.	Proper-Baits. Flies. No.	Pastes. No.	Worms. No.	Fish and Insects. No. 8.
Bream	rough str. river or mid. pond	Apr. to Mich.	Sun rise to 9 3 to Sun-set	touch ground	——	1 3	1 to 7	
Barbel	gravel-banks in currents under bridges	Apr. to Aug.	very early or late	ditto	——	2	2 6 7	——
Bleak	sandy bottom, deep rivers, ships sterns	May to Oct.	all day	6 inches from bottom	1 2	2	2 3 8	——
Carp	still, deep, mud-bottom, pond or river	May to Aug.	Sun-rise to 9 3 to Sun-set	3 inches from bottom hot weather, mid-water	——	1 3 4	1 2 3 4 7	——
Chub or Cherin	ditto	May to Dec.	ditto	litto	1 to 5	2	1 2 4 5	7 8
Dace	sandy bottom, deep rivers ships sterns	May to Oct.	all day	6 to 12 inches from bottom	ditto	3 4	1 to 5 & 8	——
Gudgeon	gravel shoals	May to Oct.	ditto	near or on ground	——	ditto	2 8	——
Pike	near clay-banks	All the year.	ditto	mid-water	wh. stro. and snap	line float hook fixt	—— on shore	1 2 3 4 5 6 7
Perch	river in stream, pond, deepest part } gravel or weedy bottom	May to Aug.	Sun-rise to 10 2 to Sun-set	ditto	2	1	3 5 7 8	1 6
		Aug. to May.	mid-day	6 inches from bottom				
Rope or Ruff	deep holes in rivers	May to Oct.	all day	ditto	5	——	all	——
Roach	sandy bottom, deep rivers, ships sterns	May to Oct.	dittc	6 to 12 inches	1 2 4 5	3 4	ditto	8
Salmon	deep rivers	Mar. to Sept.	8 to 9, 3 to 6	mid-way to the bottom	all large	——	1 5 6 7	1
Smelts	ships sterns and docks	Apr. to Oct.	all day	mid-way to the bottom variable	all small	——	1 2 5	bits of smelts.
Trout	purling streams and eddies of stony bottom river	Mar. to Mich.	ditto	cold weather, 6 inches to 9 hot weather, top to mid. wat.	1 to 5	——	1 2 5 to 8	1 8
Tench	mud-bottom-river or pond	All the year.	Sun-rise to 9 3 to Sun-set	cold weat. 3 inch. from bot. hot weather mid-water	——	1 3 4	1 3 4 to 7	——
Umber or Grayling	clay bottom, swift stream	All the year.	all day	cold weather, 6 to 9 inches hot weather top to mid-wat	1 to 5	——	all	1 8

CHAP. XXXII.

Of Shell-fish in general.—The Crustaceous Kind—The LOBSTER*—The spiny Lobster—The* CRAB*—The Land-crab—The Violet Crab—The Soldier Crab—The* TORTOISE*—The Land Tortoise—The Turtle—Of Testaceous Fish—Of the* TURBINATED*, or Snail Kind—The Garden Snail—The Fresh-water Snail—The Sea Snail—The Nautilus—Of* BIVALVED *Fish—The Oyster—The Cockle—The Scollop—The Razor Fish—Of Pearls, and the Fishery—Of* MULTIVALVE *Shell Fish—The Sea Urchin—The Pholades.*

THERE are two classes of animals, inhabiting the water, which commonly receive the name of fishes, entirely different from those we have been describing, and also very distinct from each other. These are divided by naturalists into Crustaceous and Testaceous animals: both, totally unlike fishes in appearance, seem to invert the order of nature; and as those have their bones on the inside, and their muscles hung upon them for the purposes of life and motion, these, on the contrary, have all their bony parts on the outside, and all their muscles within. Not to talk mysteriously—all who have seen a lobster or an oyster, perceive that the shell in these bears a strong analogy to the bones of other animals; and that, by these shells, the animal is sustained and defended.

Crustaceous fish, such as the crab and lobster, have a shell not quite of a stony hardness, but rather resembling a firm crust, and in some measure capable of yielding. Testaceous fishes, such as the oyster or cockle, are furnished with a shell of a stony hardness; very brittle, and incapable of yielding. Of the crustaceous kinds are the lobster, the crab, and the tortoise: of the testaceous, that numerous tribe of oysters, muscles, cockles, and sea snails, which offer with infinite variety.

The LOBSTER. However different in figure the lobster and the crab may seem, their manners and conformation are nearly the same. With all the voracious appetites of fishes, they are condemned to lead an insect life at the bottom of the water; and though pressed by continual hunger, they are often obliged to wait till accident brings them their prey.

Though without any warmth in their bodies, or even red blood circulating through their veins, they are animals wonderfully voracious. Whatever they seize upon that has life is sure to perish, though ever so well defended: they even devour each other: and, to increase our surprise still more, they may, in some measure, be said to eat themselves; as they change their shell and their stomach every year, and their old stomach is generally the first morsel that serves to glut the new.

The *Lobster* is an animal of so extraordinary a form, that those who first see it are apt to mistake the head for the tail; but it is soon discovered that the animal moves with its claws foremost; and that the part which plays within itself by joints, like a coat of armour, is the tail. The mouth, like that of insects, opens the long way of the body, not cross-ways, as with man, and the higher race of animals. It is furnished with two teeth in the mouth, for the comminution of its food; but as these are not sufficient, it has three more in the stomach; one on each side, and the other below. Between the two teeth there is a fleshy substance, in the shape of a tongue. The intestines consist of one long bowel, which reaches from the mouth to the vent; but what this animal differs in from all others is, that the spinal marrow is in the breast bone. It is furnished with two long feelers or horns, that issue on each side of the head, that seem to correct the dimness of the sight, and apprize the animal of its danger, or of its prey. The tail, or that jointed instrument at the other end, is the grand instrument of motion; and with this it can raise itself in the water. Under this we usually see lodged the spawn in great abundance; every pea adhering to the next by a very fine filament, which is scarcely perceivable. Every lobster is an hermaphrodite, and is supposed to be self-impregnated. The ovary, or place where the spawn is first produced, is backwards, toward the tail, where a red substance is always found, and which is nothing but a cluster of peas, that are yet too small for exclusion. From this receptacle there go two canals, that open on each side at the jointures of the shell, at the belly; and through these passages the peas descend to be excluded, and placed under the tail, where the animal preserves them from danger for some time, until they come to maturity: when being furnished with limbs and motion, they drop off into the water.

When the young lobsters leave the parent, they immediately seek for refuge in the smallest clefts of rocks, and in such like crevices at the bottom of the sea, where the en-

trance is but small, and the opening can be easily defended. There, without seeming to take any food, they grow larger in a few weeks time, from the mere accidental substances which the water washes to their retreats. By this time also they acquire an hard, firm shell, which furnishes them with both offensive and defensive armour. They then begin to issue from their fortresses, and boldly creep along the bottom, in hopes of meeting with diminutive plunder. The spawn of fish, the smaller animals of their own kind, but chiefly the worms that keep at the bottom of the sea, supply them with plenty. They keep in this manner close among the rocks, busily employed in scratching up the sand with their claws for worms, or surprising such heedless animals as fall within their grasp: thus they have little to apprehend, except from each other; for in them, as among fishes, the large are the most formidable of all enemies to the small.

But this life of abundance and security is soon to have a most dangerous interruption; for the body of the lobster still continuing to increase, while its shell remains unalterably the same, the animal becomes too large for its habitation, and imprisoned within the crust that has naturally gathered round it there comes on a necessity of getting free. The young of this kind, therefore, that grow faster, as we are assured by the fishermen, change their shell oftener than the old, who come to their full growth, and who remain in the same shell often for two years together. In general, however, all these animals change their shell once a year; and this is not only a most painful operation, but also subjects them to every danger. Just before casting its shell, it throws itself upon its back, strikes its claws upon each other, and every limb seems to tremble; its feelers are agitated, and the whole body is in violent motion: it then swells itself in an unusual manner, and at last the shell is seen beginning to divide at its junctures. It also seems turned inside out; and its stomach comes away with its shell. After this, by the same operation, it disengages itself of the claws, which burst at the joints; the animal, with a tremulous motion, casting them off as a man would kick off a boot that was too big for him.

Thus, in a short time, this wonderful creature finds itself at liberty; but in such a weak and enfeebled state, that it continues for several hours motionless. Indeed, so violent and painful is the operation, that many of them die under it; and those which survive are in such a weakly state for some time, that they neither take food, nor venture from their retreats. Immediately after this change, they have not only the softness, but the timidity of a worm. Every animal

of the deep is then a powerful enemy, which they can neither escape nor oppose; and this in fact, is the time when the dog-fish, the cod, and the ray, devour them by hundreds. But this state of defenceless imbecility continues for a very short time: the animal, in less than two days, is seen to have the skin that covered its body grown almost as hard as before; its appetite is seen to increase; and, strange to behold, the first object that tempts its gluttony is its own stomach, which it so lately was disengaged from. This it devours with great eagerness; and, some time after, eats even its former shell. In about forty-eight hours, in proportion to the animal's health and strength, the new shell is perfectly formed, and as hard as that which was but just thrown aside.

When the lobster is completely equipped in its new shell, it then shews how much it has grown in the space of a very few days; the dimensions of the old shell being compared with those of the new, it will be found that the creature is increased above a third in its size; and, like a boy that has outgrown his clothes, it seems wonderful how the deserted shell was able to contain so great an animal as entirely fills up the new.

The creature thus furnished, not only with a complete covering, but also a greater share of strength and courage, ventures more boldly among the animals at the bottom; and not a week passes that in its combats it does not suffer some mutilation. A joint, or even a whole claw, is sometimes snapped off in these encounters. At certain seasons of the year, these animals never meet each other, without an engagement. In these, to come off with the loss of a leg, or even a claw, is considered as no great calamity; the victor carries off the spoil to feast upon at his leisure, while the other retires from the defeat to wait for a thorough repair. This repair is not long in procuring. From the place where the joint of the claw was cut away, is seen in a most surprising manner, to burgeon out the beginning of a new claw. This, if observed, at first is small and tender, but grows, in the space of three weeks, to be almost as large and as powerful as the old one. We say almost as large, for it never arrives to the full size; and this is the reason we generally find the claws of the lobsters of unequal magnitude.

Of this extraordinary, yet well known animal, there are many varieties, with some differences in the claws, but little in the habits or conformation. It is found above three feet long; and, if we may admit the shrimp and the prawn into

the class, though unfurnished with claws, it is seen not above an inch. These all live in the water, and can bear its absence for but a few hours. The shell is black when taken out of the water, but turns red by boiling. The most common way of taking the lobster is in a basket, or pot, as the fishermen call it, made of wicker work, in which they put the bait, and then throw it to the bottom of the sea, in six or ten fathom water. The lobsters creep into this for the sake of the bait, but are not able to get out again. The *river craw-fish* differs little from the lobster, but that the one will live only in fresh-water, and the other will thrive only in the sea.

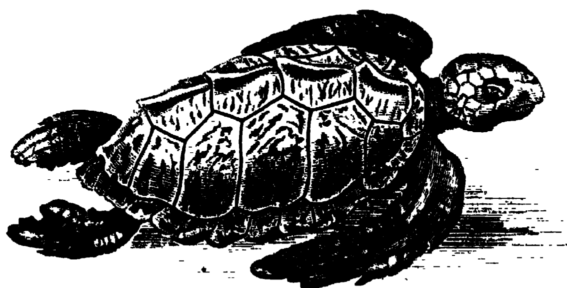
The *spiny Lobster* also differs merely by the offensive armour which it bears upon its back and claws.

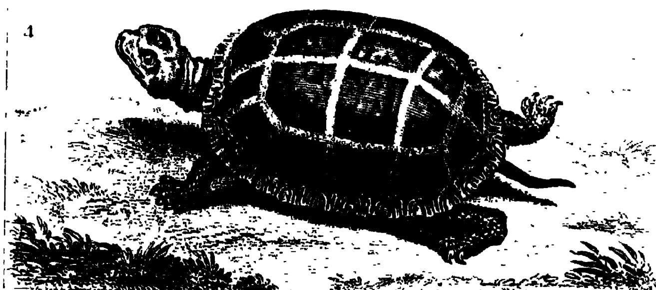
As the Crab is found upon land as well as in the water, the peculiarity of its situation produces a difference in its habitudes, which it is proper to describe. The *Land-crab* is found in some of the warmer regions of Europe, and in great abundance in all the tropical climates in Africa and America. They are of various kinds, and endued with various properties; some being healthful, delicious, and nourishing food; others poisonous or malignant to the last degree; some are not above half a inch broad, others are found a foot over; some are of a dirty brown, and others beautifully mottled. That animal, called the *violet crab* of the Caribee Islands, is the most noted, both for its shape, the delicacy of its flesh, and the singularity of its manners.

The *violet crab* somewhat resembles two hands cut through the middle and joined together; for each side looks like four fingers, and the two nippers or claws resemble the thumbs. All the rest of the body is covered with a shell as large as a man's hand and bunched in the middle, on the fore-part of which there are two long eyes of the size of a grain of barley, as transparent as crystal and as hard as horn. A little below these is the mouth, covered with a sort of barbs, under which there are two broad sharp teeth as white as snow. They are not placed, as in other animals, crossways, but in the opposite direction, not much unlike the blade of a pair of scissars. With these teeth they can easily cut leaves, fruits, and rotten wood, which is their usual food. But their principal instrument for cutting and seizing their food is their nippers, which catch such an hold, that the animal loses the limb sooner than its grasp, and is often seen scampering off, having left its claw still holding fast upon the enemy. The faithful claw seems to perform its duty, and keeps for above a minute fastened upon the









1. Spiny Lobster. — 2. Violet Crab. — 3. Sea Tortoise.
4. Land Tortoise.

finger while the crab is making off*. In fact it loses no great matter by leaving a leg or an arm, for they soon grow again, and the animal is found as perfect as before.

This, however, is the least surprising part of this creature's history: and what we are going to relate, were it not as well known and as confidently confirmed as any other circumstance in Natural History, might well stagger our belief. These animals live not only in a kind of society in their retreats in the mountains, but regularly once a year march down to the sea-side in a body of some millions at a time. As they multiply in great numbers, they choose the months of April or May to begin their expedition; and then sally out by thousands from the stumps of hollow trees, from the clifts of rocks, and from the holes which they dig for themselves under the surface of the earth. At that time the whole ground is covered with this band of adventurers; there is no setting down one's foot without treading upon them. The sea is the place of destination, and to that they direct their march with right-lined precision. No geometrician could send them to their destined station by a shorter course; they neither turn to the right or left, whatever obstacles intervene; and even if they meet with a house, they will attempt to scale the walls to keep the unbroken tenor of their way. But though this be the general order of their route, they upon other occasions are compelled to conform to the face of the country; and if it be intersected by rivers, they are then seen to wind along the course of the stream. The procession sets forward from the mountains with the regularity of an army under the guidance of an experienced commander. They are commonly divided into three battalions; of which the first consists of the strongest and boldest males that, like pioneers, march forward to clear the route and face the greatest dangers. These are often obliged to halt for want of rain, and go into the most convenient encampment till the weather changes. The main body of the army is composed of females, which never leave the mountains till the rain is set in for some time, and then descend in regular battalia, being formed into columns of fifty paces broad, and three miles deep, and so close that they almost cover the ground. Three or four days after this the rear-guard follows; a straggling, undisciplined tribe consisting of males and females, but neither so robust nor so numerous as the former. The night is their chief time of proceeding; but if it rains by day, they do not fail to profit by the occasion; and they continue to move forward

* Brown's Jamaica, p. 423.

in their slow uniform manner. When the sun shines and is hot upon the surface of the ground, they then make an universal halt, and wait till the cool of the evening. When they are terrified, they march back in a confused disorderly manner, holding up their nippers, with which they sometimes tear off a piece of the skin, and then leave the weapon where they inflicted the wound. They even try to intimidate their enemies; for they often clatter their nippers together, as if it were to threaten those that come to disturb them. But though they thus strive to be formidable to man, they are much more so to each other; for they are possessed of one most unsocial property, which is, that if any of them by accident is maimed in such a manner as to be incapable of proceeding, the rest fall upon and devour it on the spot, and then pursue their journey.

When after a fatiguing march, and escaping a thousand dangers, for they are sometimes three months in getting to the shore, they have arrived at their destined port, they prepare to cast their spawn. The peas are as yet within their bodies, and not excluded, as is usual in animals of this kind, under the tail; for the creature waits for the benefit of the sea-water to help the delivery. For this purpose, the crab has no sooner reached the shore, than it eagerly goes to the edge of the water, and lets the waves wash over its body two or three times. This seems only a preparation for bringing their spawn to maturity; for without farther delay they withdraw to seek a lodging upon land: in the mean time the spawn grows larger, is excluded out of the body, and sticks to the barbs under the flab, or more properly the tail. This bunch is seen as big as an hen's egg, and exactly resembling the roes of herrings. In this state of pregnancy, they once more seek the shore for the last time, and shaking off their spawn into the water, leave accident to bring it to maturity. At this time whole shoals of hungry fish are at the shore, and about two thirds of the crabs eggs are immediately devoured by these rapacious invaders. The eggs that escape are hatched under the sand; and soon after millions at a time of these little crabs are seen quitting the shore, and slowly travelling up to the mountains.

The old ones, however, are not so active to return; they have become so feeble and lean, that they can hardly creep along, and the flesh at that time changes its colour. Most of them, therefore, are obliged to continue in the flat parts of the country till they recover, making holes in the earth, which they cover at the mouth with leaves and dirt, so that no air may enter. There they throw off their old shells,

which they leave as it were quite whole, the place where they are opened on the belly being unseen. At that time they are quite naked, and almost without motion for six days together, when they become so fat as to be delicious food. They have then under their stomachs four large white stones, which gradually decrease in proportion as the shell hardens, and when they come to perfection are not to be found. It is at that time that the animal is seen slowly making its way back; and all this is most commonly performed in the space of six weeks.

The descent of these creatures for such important purposes deserves our admiration; but there is an animal of the lobster kind that anually descends from its mountains in like manner, and for purposes still more important and various. Its descent is not only to produce an offspring, but to provide itself a covering; not only to secure a family, but to furnish an house. The animal in question is the *soldier-crab*, which has some similitude to the lobster, if divested of its shell. It is usually about four inches long, has no shell behind, but is covered down to the tail with a rough skin, terminating in a point. It is however armed with strong hard nippers before, like the lobster; and one of them is as thick as a man's thumb, and pinches most powerfully. It is, as was said, without a shell to any part except its nippers; but what Nature has denied this animal it takes care to supply by art; and taking possession of the deserted shell of some other animal, it resides in it, till, by growing too large for its habitation, it is under a necessity of change. It is a native of the West India Islands; and like the former, it is seen every year descending from the mountains to the sea-shore, to deposit its spawn, and to provide itself with a new shell. This is a most bustling time with it, having so many things to do: and, in fact, very busy it appears. It is very probable that its first care is to provide for its offspring before it attends to its own wants; and it is thought, from the number of little shells which it is seen examining, that it deposits its spawn in them, which thus is placed in perfect security till the time of exclusion.

Yet it is not only till after many trials, but many combats also, that the soldier is completely equipped; for there is often a contest between two of them for some well-looking favourite shell for which they are rivals. They both endeavour to take possession; they strike with their claws; they bite each other, till the weakest is obliged to yield, by giving up the object of dispute. It is then that the victor

immediately takes possession, and parades in his new conquest three or four times back and forward upon the strand before his envious antagonist.

When this animal is taken, it sends forth a feeble cry, endeavouring to seize the enemy with his nippers; which if it fastens upon, it will sooner die than quit the grasp. The wound is very painful, and not easily cured. For this reason, and as it is not much esteemed for its flesh, it is generally permitted to return to its old retreat to the mountains in safety. There it continues till the necessity of changing once more, and the desire of producing an offspring, expose it to fresh dangers the year ensuing.

There are many other species of this animal, such as the *lobster-crab*, the *river crab*, the *minute crab*, which is found in the inside of muscles, &c.

Tortoises are usually divided into those that live upon land, and those that subsist in the water; and use has made a distinction even in the name; the one being called tortoises, the other turtles. However, Seba has proved that all tortoises are amphibious; that the land tortoise will live in the water; and that the sea turtle can be fed upon land. A land tortoise was brought to him that was caught in one of the canals of Amsterdam, which he kept for half a year in his house, where it lived very well contented in both elements. When in the water it remained with its head above the surface; when placed in the sun, it seemed delighted with its beams, and continued immoveable while it felt their warmth. The difference, therefore, in these animals, arises rather from their habits than their conformation; and, upon examination, there will be less variety found between them than between birds that live upon land, and those that swim upon the water.

All tortoises, in their external form, much resemble each other; their outward covering being composed of two great shells, the one laid upon the other, and only touching at the edges; however when we come to look closer, we shall find that the upper shell is composed of no less than thirteen pieces. There are two holes at either edge of this vaulted body; one for a very small head, shoulders and arms, to peep through, the other at the opposite edge, for the feet and the tail. These shells the animal is never disengaged from; and they serve for its defence against every creature but man.

The *land tortoise* is generally found from one to five feet long. from the end of the snout to the end of the tail; and

from five inches to a foot and a half across the back. It has a small head, somewhat resembling that of a serpent: an eye without the upper lid; the under eye-lid serving to cover and keep that organ in safety. It has a strong, scaly tail, like the lizard. Its head the animal can put out and hide at pleasure, under the great penthouse of its shell: there it can remain secure from all attacks. As the tortoise lives wholly upon vegetable food, it never seeks the encounter; yet, if any of the smaller animals attempt to invade its repose, they are sure to suffer. The tortoise, impregnably defended, is furnished with such a strength of jaw, that, though armed only with bony plates instead of teeth, wherever it fastens, it infallibly keeps its hold, until it has taken out the piece.

Though peaceable in itself it is formed for war in another respect, for it seems almost endued with immortality. Nothing can kill it; the depriving it of one of its members is but a slight injury; it will live, though deprived of the brain; it will live, though deprived of its head. Tortoises are commonly known to exceed eighty years; and there was one kept in the Archbishop of Canterbury's garden at Lambeth, that was remembered above an hundred and twenty. It was at last killed by the severity of the frost, from which it had not sufficiently defended itself in its winter retreat, which was a heap of sand, at the bottom of the garden.

Though there is a circulation of blood in the tortoise, yet as the lungs are left out of the circulation, the animal is capable of continuing to live without continuing to breathe. In this it resembles the bat, the serpent, the mole, and the lizard; like them it takes up its dark residence for the winter, and, at that time, when its food is no longer in plenty, it happily becomes insensible to want. But it must not be supposed that, while it is thus at rest, it totally discontinues to breathe; on the contrary, an animal of this kind, if put into a close vessel, without air, will soon be stifled; though not so readily as in a state of vigour and activity.

The eggs of all the tortoise kind, like those of birds, are furnished with a yelk and a white; but the shell is different, being somewhat like those soft eggs that hens exclude before their time: however, this shell is much thicker and stronger, and is a longer time in coming to maturity in the womb. The land tortoise lays but a few in number, if compared to the sea turtle, who deposits from an hundred and fifty to two hundred in a season.

The amount of the land tortoise's eggs we have not been able to learn; but, from the scarceness of the animal, we are apt to think they cannot be very numerous. When it prepares to lay, the female scratches a slight depression in the

earth, generally in a warm situation, where the beams of the sun have their full effect. There depositing her eggs, and covering them with grass and leaves, she forsakes them, to be hatched by the heat of the season. The young tortoises are generally excluded in about twenty-six days; but, as the heat of the weather assists, or its coldness retards incubation, sometimes it happens that there is a difference of two or three days. The little animals no sooner leave the egg, than they seek for their provision, entirely self-taught: and their shell, with which they are covered from the beginning, expands and grows larger with age. As it is composed of a variety of pieces, they are all capable of extension at their sutures; and the shell admits of increase in every direction.

It is common enough to take these animals into gardens, as they are thought to destroy insects and snails in great abundance. We are even told that, in hot countries, they are admitted into a domestic state, as they are great destroyers of bugs.

The *Sea Tortoise*, or *Turtle*, as it is now called, is generally found larger than the former.

The great Mediterranean turtle is the largest of the turtle kind with which we are acquainted. It is found from five to eight feet long, and from six to nine hundred pounds weight; but, unluckily, its utility bears no proportion to its size, as it is unfit for food, and sometimes poisons those who eat it. The shell also, which is a tough, strong integument, resembling an hide, is unfit for all serviceable purposes One of these animals was taken in the year 1729, at the mouth of the Loire, in nets that were not designed for so large a capture. This turtle, which was of enormous strength, by its own struggles, involved itself in the nets in such a manner as to be incapable of doing mischief: yet, even thus shackled, it appeared terrible to fishermen, who were at first for flying; but finding it impotent, they gathered courage to drag it on shore, where it made a most horrible bellowing; and when they began to knock it on the head with their gaffs, it was to be heard at half a mile's distance. They were still further intimidated by its nauseous and pestilential breath, which so powerfully affected them, that they were near fainting. This animal wanted but four inches of being eight feet long, and was about two feet over; its shell more resembled leather than the shell of a tortoise; and, unlike all other animals of this kind, it was furnished with teeth in each jaw, one rank behind another, like those of a shark; its feet, also different from the rest of this kind, wanted claws; and the tail was quite disengaged from the shell, and fifteen inches long, more resembling that of a quadruped, than a tortoise.

These are a formidable and useless kind, if compared to the turtle caught in the South Seas and the Indian Ocean. These are of different kinds; not only unlike each other in form, but furnishing man with very different advantages. They are usually distinguished by sailors into four kinds; the Trunk Turtle, the Loggerhead, the Hawksbill, and the Green Turtle.

The Hawksbill Turtle is the least of the four, and has a long and small mouth, somewhat resembling the bill of an hawk. The flesh of this also is very indifferent eating; but the shell serves for the most valuable purposes. This is the animal that supplies the tortoise-shell, of which such a variety of beautiful trinkets are made.

But of all animals of the tortoise kind, the green turtle is the most noted, and the most valuable, from the delicacy of its flesh, and its nutritive qualities, together with the property of being easily digested. It is generally found about two hundred weight; though some are five hundred, and others not above fifty.

This animal seldom comes from the sea but to deposit its eggs. Its chief food consists of the mangrove, the black-wood tree and other marine plants. When the weather is fair, the turtles are sometimes seen feeding in great numbers, like flocks of sheep, several fathoms deep upon the verdant carpet below. They frequent the creeks and shallows where they are usually taken; but they are extremely shy of boats and men, and swim remarkably fast.

When the time for laying approaches, the female is seen, towards the setting of the sun, drawing near the shore, and looking earnestly about her, as if afraid of being discovered. When she perceives any person on shore, she seeks for another place; but if otherwise, she lands when it is dark, and goes to take a survey of the sand where she designs to lay. Having marked the spot, she goes back without laying, for that night, to the ocean again; but the next night returns to deposit a part of her burden. She begins by working and digging in the sand with her fore feet, till she has made a round hole, a foot broad, and a foot and a half deep, just at the place a little above where the water reaches highest. This done, she lays eighty or ninety eggs at a time, each as big as a pigeon's egg. The eggs are covered with a tough, white skin, like wetted parchment. When she has done laying, she covers the hole so dexterously, that it is no easy matter to find the place. When the turtle has done laying, she returns to the sea, and leaves her eggs to be hatched by the heat of the sun. At the end of fifteen days, she lays about the same number of eggs again; and at the end of

another fifteen days, she repeats the same; three times in all, using the same precautions every time for their safety.

In about twenty-four or twenty-five days after laying the eggs are hatched by the heat of the sun; and the young turtles, being about as big as quails, are seen bursting from the sand, as if earth-born, and running directly to the sea, with instinct only for their guide; but, to their great misfortune, it often happens that their strength being small, the surges of the sea, for some few days, beat them back upon the shore. Thus exposed, they remain a prey to thousands of birds that haunt the coasts; and these stooping down upon them, carry off the greatest part, and sometimes the whole brood, before they have strength sufficient to withstand the waves or dive to the bottom. They are generally caught in two ways, by nets, and by what is called pegging. The peg is of iron, and something larger than a tenpenny nail, and without a barb; to this is affixed an iron socket, in which is inserted a long pole, and the peg is held by a tolerably strong line. When the turtle is struck, the hunter disengages the pole, and draws the turtle to the boat by the line.

There is yet another way which, though seemingly awkward, is said to be attended with very great success. A good diver places himself at the head of the boat; and when the turtles are observed, which they sometimes are in great numbers, asleep on the surface, he immediately quits the vessel at about fifty yards' distance, and, keeping still under water, directs his passage to where the turtle was seen, and coming up beneath, seizes it by the hind-fin; the animal awaking, struggles to get free; and by this both are kept at the surface until the boat arrives to take them in.

The shell of TESTACEOUS FISHES may be considered as an habitation supplied by nature. It is an hard stony substance, made by some in the manner of a wall. Part of the stony substance the animal derives from outward objects, and the fluids of the animal itself furnish the cement. These united make that firm covering which shell-fish generally reside in till they die.

But, in order to give a more exact idea of the manner in which sea-shells are formed, we must have recourse to an animal that lives upon land, with the formation of whose shell we are best acquainted. This is the garden-snail that carries its box upon its back.

To begin with the animal in its earliest state, and trace the progress of its shell from the time it first appears. The instant the young snail leaves the egg, it carries its shell or its box on its back. It does not leave the egg till it is

arrived at a certain growth, when its little habitation is sufficiently hardened. This beginning of the shell is not much bigger than a pin's head, but grows in a very rapid manner, having at first but two circumvolutions, for the rest are added as the snail grows larger. In proportion as the animal increases in size, the circumvolutions of the shell increase also, until the number of those volutes come to be five, which is never exceeded.

The part where the animal enlarges its shell is at the mouth, to which it adds in proportion as it finds itself stinted in its habitation below. Being about to enlarge its shell, it is seen with its little teeth biting and clearing away the scaly skin that grows at the edges. It is sometimes seen to eat those bits it thus takes off; and at other times it only cleans away the margin when covered with films, and then adds another rim to its shell.

For the purposes of making the shell, which is natural to the animal, and without which it would not live three days, its whole body is furnished with glands, from the orifices of which flows out a kind of slimy fluid, like small spiders threads, which join together in one common crust or surface, and in time condense and acquire a stony hardness. It is this slimy humour that grows into a membrane and afterwards a stony skin, nor can it have escaped any who have observed the track of a snail; that glistening substance which it leaves on the floor or the wall is no other than the materials with which the animal adds to its shell, or repairs it when broken.

With respect to the figure of shells, Aristotle has divided them into three kinds; and his method is, above all others, the most conformable to nature. These are, first, the univalve, or *turbinated*, which consist of one piece, like the box of a snail; secondly, the *bivalve*, consisting of two pieces, united by a hinge, like an oyster; and thirdly, the *multivalve*, consisting of more than two pieces, as the acorn-shell, which has not less than twelve pieces that go to its composition. All these kinds are found in the sea at different depths; and are valuable in proportion to their scarceness or beauty. All shells are formed of an animal or calcareous earth, that ferments with vinegar and other acids, and that burns into lime, and will not easily melt into glass.

Every shell, wherever it is found, is the spoil of some animal, that once found shelter therein. It matters not by what unaccountable means they may have wandered from the sea; but they exhibit all, and the most certain marks of their origin. From their numbers and situation, we are led to conjecture, that the sea reached the places where they are found; and from their varieties we learn how little we know

of all the sea contains at present; as the earth furnishes many kinds which our most exact and industrious shell-collectors have not been able to fish up from the deep.

Univalve or Turbinated Shell-fish.

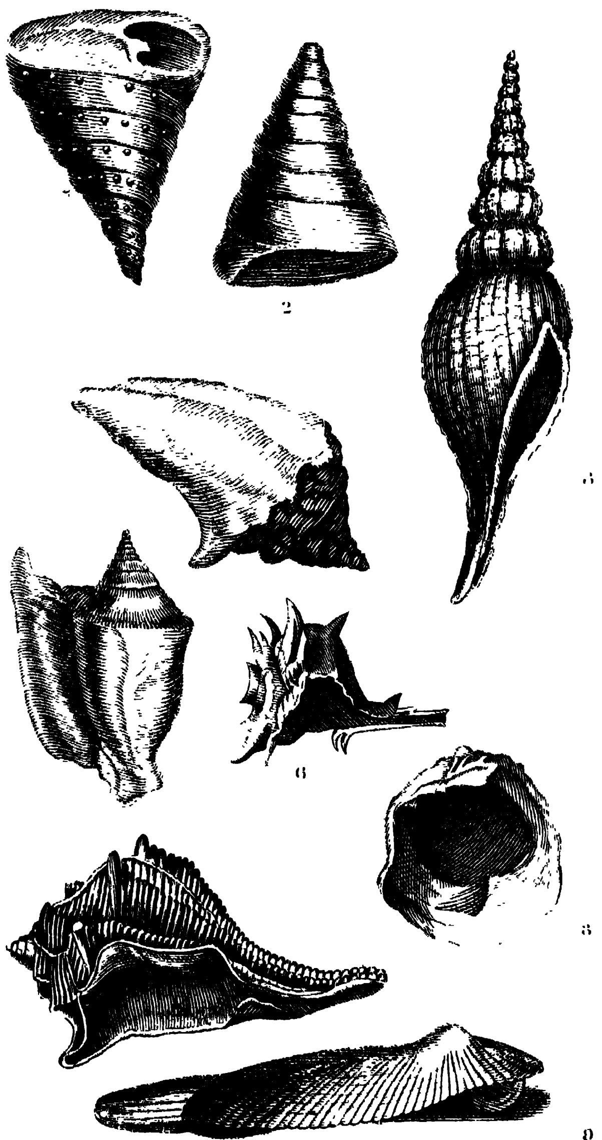
To conceive the manner in which these animals subsist that are hid from us at the bottom of the deep, we must again have recourse to one of a similar nature and formation, that we know, viz. the GARDEN-SNAIL. It is furnished with the organs of life in a manner almost as complete as the largest animal; with a tongue, brain, salival ducts, glands, nerves, stomach, and intestines, liver, heart and blood-vessels: besides these, it has a purple bag that furnishes a red matter to different parts of the body, together with strong muscles that hold it to the shell, and which are hardened, like tendons, at their insertion.

But these it possesses in common with other animals. We must now see what it has peculiar to itself. The first striking peculiarity is, that the animal has got its eyes on the points of its largest horns. When the snail is in motion four horns are distinctly seen; but the two uppermost and longest deserve peculiar consideration, both on account of the various motions with which they are endued, as well as their having their eyes fixed at the extreme ends of them. The eyes the animal can direct to different objects at pleasure, by a regular motion out of the body; and sometimes it hides them, by a very swift contraction into the belly. Under the small horns is the animal's mouth; and though it may appear too soft a substance to be furnished with teeth, yet it has not less than eight of them, with which it devours leaves, and other substances, seemingly harder than itself; and with which it sometimes bites off pieces of its own shell.

At the expiration of eighteen days after coition, the snails produce their eggs, and hide them in the earth with the greatest solicitude and industry. These eggs are in great numbers, round, white, and covered with a soft shell: they are also stuck to each other by an imperceptible slime; like a bunch of grapes, of about the size of a small pea.

The snail is possessed not only of a power of retreating into its shell, but of mending it when broken. Sometimes these animals are crushed seemingly to pieces; and to all appearance utterly destroyed; yet still they set themselves to work, and, in a few days, mend all their numerous breaches. The same substance by which the shell is originally made, goes to the re-establishment of the ruined habitation.

As the snail is furnished with all the organs of life and sen-



1. Trochus.—2. Pyrimidal Trochus.—3. Large Turbinated shell.—4. Murex.—5. Oriental Murex.—6 & 7. Purple?
8. Painted Conch. 9. Conch with the Animal?

sation, it is not wonderful to see it very voracious. It chiefly subsists upon the leaves of plants and trees; but is very delicate in its choice. At the approach of winter, it buries itself in the earth, or retires to some hole to continue in a torpid state, during the severity of the season. It is sometimes seen alone; but more frequently in company in its retreat; several being usually found together apparently deprived of life and sensation. For the purposes of continuing in greater warmth and security, the snail forms a cover or lid to the mouth of its shell with its slime, which stops it up entirely, and thus protects it from every external danger. When the cover is formed too thick, the snail then breaks a little hole in it, which corrects the effect of that closeness, which proceeded from too much caution. In this manner, sheltered in its hole from the weather, defended in its shell by a cover, it sleeps during the winter; and for six or seven months continues without food or motion, until the genial call of spring breaks its slumber, and excites its activity.

The snail, having slept for so long a season, awakes one of the first fine days of April; breaks open its cell, and sallies forth to seek for nourishment. At first, it is not very difficult in the choice of its food; almost any vegetable that is green seems welcome; but the succulent plants of the garden are chiefly grateful; and the various kinds of pulse are, at some seasons, almost wholly destroyed by their numbers. A wet season is generally favourable to their production; for this animal cannot bear very dry seasons, or dry places, as they cause too great a consumption of its slime, without plenty of which it cannot subsist in health and vigour.

Such are the most striking particulars in the history of this animal; and this may serve as a general picture, to which the manners and habitudes of the other tribes of this class may be compared and referred. These are, the sea snail, of which naturalists have, from the apparent difference of their shells, mentioned fifteen kinds;* the fresh water snail, of which there are eight kinds; and the land-snail, of which there are five: and these all bear a strong resemblance to the garden snail. All SNAILS THAT LIVE IN WATER, are peculiarly furnished with a contrivance by Nature, for rising to the surface, or sinking to the bottom. The manner in which this is performed, is by opening and shutting an orifice on the right side of the neck, which is furnished with muscles for that purpose. The snail sometimes gathers this aperture into

* D'Argenville's Conchyliologie

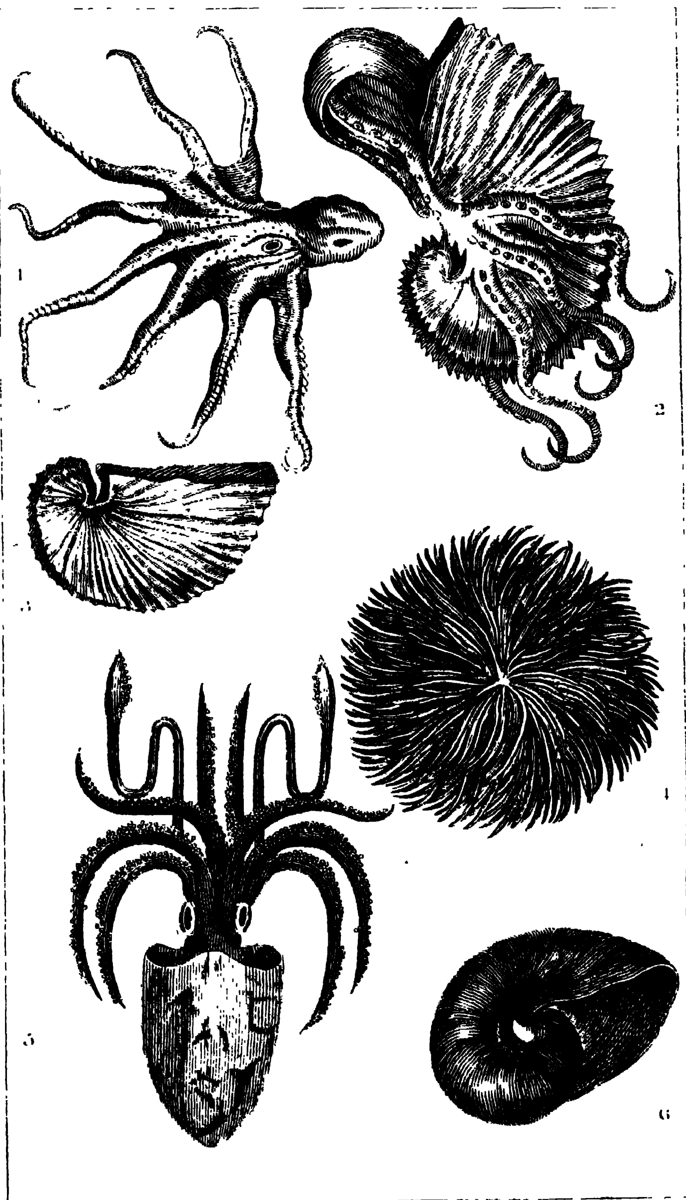
an oblong tube, and stretches or protends it above the surface of the water, in order to draw in or expel the air, as it finds occasion. This may not only be seen, but heard also by the noise which the snail makes in moving the water. By dilating this it rises; by compressing it, the animal sinks to the bottom.

But what renders these animals far more worthy of notice is, that they are viviparous, and bring forth their young not only alive, but with their shells upon their backs. This seems surprising; yet it is incontestibly true: the young come to some degree of perfection in the womb of the parent; there they receive their stony coat; and thence are excluded, with a complete apparatus for subsistence.

This striking difference between the fresh-water and the garden snail, obtains also in some of the SEA KIND; among which there are some that are found viviparous, while others lay eggs in the usual manner. But this is not the only difference between land and sea snails. Many of the latter entirely want horns; and none of them have above two. Indeed, if the horns of snails be furnished with eyes, and if, as some are willing to think, the length of the horn, like the tube of a telescope, assists vision, these animals, that chiefly reside in the gloomy bottom of the deep, can have no great occasion for them. Eyes would be unnecessary to creatures whose food is usually concealed in the darkest places; and who, possessed of very little motion, are obliged to grope for what they subsist on. To such, eyes would rather be an obstruction than an advantage; and perhaps even those that live upon land are without them!

There is a difference also in the position of the mouth, in the garden and the water snail. In the former, the mouth is placed cross-wise, as in quadrupeds; furnished with jawbones, lips, and teeth. In most of the sea-snails, the mouth is placed longitudinally in the head; and, in some, obliquely, or on one side. Others, of the trochus kind, have no mouth whatsoever; but are furnished with a trunk, very long in some kinds, and shorter in others.

Of all sea snails, that which is most frequently seen swimming upon the surface, and whose shell is the thinnest and most easily pierced, is the NAUTILUS. Whether, upon these occasions, it is employed in escaping its numerous enemies at the bottom, by seeking its food at the surface, we will not venture to decide. It seems most probable, that the former is the cause of its frequently appearing; for, upon opening the stomach, it is found to contain chiefly that food which it finds at the bottom.



1. Polypus. — 2 & 3. Nautilus. — 4. Sea Urchin:
5. Cuttle Fish. — 6. Shell of Nautilus.

Although there are several species of the nautilus, yet they all may be divided into two: the one with a white shell, as thin as paper, which it often is seen to quit, and again to resume; the other with a thicker shell, sometimes of a beautiful mother-of-pearl colour, and that quits its shell but rarely. This shell outwardly resembles that of a large snail, but is generally six or eight inches across: within, it is divided into forty partitions, that communicate with each other by doors, if we may so call them, through which one could not thrust a goose-quill: almost the whole internal part of the shell is filled by the animal, the body of which, like its habitation, is divided into as many parts as there are chambers in its shell: all the parts of its body communicate with each other, through the doors or openings, by a long blood-vessel, which runs from the head to the tail: thus the body of the animal, if taken out of the shell, may be likened to a number of soft bits of flesh, of which there are forty threaded upon a string. From this extraordinary conformation, one would not be apt to suppose that the nautilus sometimes quitted its shell, and returned to it again; yet nothing, though seemingly impossible, is more certain. The manner by which it contrives to disengage every part of its body from so intricate an habitation; by which it makes a substance, to appearance as thick as one's wrist, pass through forty doors, each of which would scarcely admit a goose quill, is not yet discovered: but the fact is certain; for the animal is often found without its shell; and the shell more frequently destitute of the animal. It is most probable, that it has a power of making the substance of one section of its body remove up into that which is next; and thus, by multiplied removals, it gets free.

But this, though very strange, is not the peculiarity for which the nautilus has been the most distinguished. Its spreading the thin oar, and catching the flying gale, to use the poet's description of it, has chiefly excited human curiosity. These animals, particularly those of the white, light kind, are chiefly found in the Mediterranean; and scarcely any who have sailed on that sea, but must have often seen them. When the sea is calm, they are observed floating on the surface; some spreading their little sail; some rowing with their feet, as if for life and death; and others still, floating upon their mouths, like a ship with the keel upward. If taken while thus employed, and examined, the extraordinary mechanism of their limbs for sailing will appear more manifest. The nautilus is furnished with eight feet, which issue near the mouth, and may as properly be called barbs: these are connected to each other by a thin skin, like that between the toes of a duck, but much thinner, and more transparent. Of

these eight feet thus connected, six are short, and these are held up as sails to catch the wind in sailing: the two others are longer, and are kept in the water; serving, like paddles, to steer their course by. When the weather is quite calm, and the animal is pursued from below, it is then seen expanding only a part of its sail, and rowing with the rest: whenever it is interrupted, or fears danger from above, it instantly furls the sail, catches in all its oars, turns its shell mouth downward, and instantly sinks to the bottom. Sometimes also it is seen pumping the water from its leaking hulk; and, when unfit for sailing, deserts its shell entirely. The forsaken hulk is seen floating along, till it dashes, by a kind of shipwreck, upon the rocks or the shore.

It may seem whimsical to make a distinction between the animal perfection of turbinated and *Bivalved Shell-fish*, or to grant a degree of superiority to the snail above the oyster. Yet this distinction strongly and apparently obtains in nature; and we shall find the bivalved tribe of animals in every respect inferior to those we have been describing.

The MUSCLE, as is well known, whether belonging to fresh or salt water, consists of two equal shells, joined at the back by a strong muscular ligament that answers all the purposes of an hinge. By the elastic contraction of this, the animal can open its shells at pleasure, about a quarter of an inch from each other. The fish is fixed to either shell by four tendons, by means of which it shuts them close, and keeps its body firm from being crushed by any shock against the walls of its own habitation. It is furnished, like all other animals of this kind, with vital organs, though these are situated in a very extraordinary manner. It has a mouth furnished with two fleshy lips; its intestines begin at the bottom of the mouth, pass through the brain, and make a number of circumvolutions through the liver; on leaving this organ, it goes on straight into the heart, which it penetrates, and ends in the anus; near which the lungs are placed, and through which it breathes, like those of the snail kind; and in this manner its languid circulation is carried on.

The multitude of these animals in some places is very great; but from their defenceless state, the number of their destroyers are in equal proportion.

But notwithstanding the number of this creature s animated enemies, it seems still more fearful of the agitations of the element in which it resides; for if dashed against rocks, or thrown far on the beach, it is destroyed without a

power of redress. In order to guard against these, which are to this animal the commonest and the most fatal accidents, although it has a power of slow motion, which we shall presently describe, yet it endeavours to become stationary, and to attach itself to any fixed object it happens to be near. For this purpose it is furnished with a very singular capacity of binding itself by a number of threads to whatever object it approaches; and these Reaumur sup posed it spun artificially, as spiders their webs, which they fasten against a wall. Of this, however, later philosophers have found very great reason to doubt. It is therefore supposed that these threads, which are usually called the beard of the muscle, are the natural growth of the animal's body, and by no means produced at pleasure.

Its instrument of motion, by which it contrives to reach the object it wants to bind itself to, is that muscular substance resembling a tongue, which is found long in proportion to the size of the muscle. In some it is two inches long, in others not a third part of these dimensions. This the animal has a power of thrusting out of its shell; and with this it is capable of making a slight furrow in the sand at the bottom By means of this furrow it can erect itself upon the edge of its shell; and thus continuing to make the furrow in proportion as it goes forward, it reaches out its tongue, that answers the purpose of an arm, and thus carries its shell edge-ways, a sin a groove, until it reaches the point intended. There where it determines to take up its residence it fixes the ends of its beard, which are glutinous, to the rock oı the object, whatever it be; and thus, like a ship at anchor, braves all the agitations of the water. The beards have been seen a foot and a half long; and of this substance the natives of Palermo sometimes make gloves and stockings.

These shell-fish are found in lakes, rivers, and in the sea. Those of the lake often grow to a very large size but they seem a solitary animal, and are found generally separate from each other. Those of rivers are not so large; but yet in greater abundance; but the sea muscle is in most plenty. These are often bred artificially in salt water marshes that are overflowed by the tide; the fishermen throwing them in at the proper seasons; and there, being undisturbed by the agitations of the sea, and not preyed upon by their powerful enemies at the bottom, they cast their eggs, which soon become perfect animals, and these are generally found in clusters of several dozen together. It requires a year for the peopling a muscle-bed; so that, if the number consists of forty thousand, a tenth part may annually be left for the peopling the bed anew. Muscles are taken from their beds

from the month of July to October; and they are sold at a very moderate price.

From this animal the OYSTER differs very little, except in the thickness of its shell, and its greater imbecility. The oyster, like the muscle, is formed with organs of life and respiration, with intestines which are very voluminous, a liver, lungs, and heart. Like the muscle, it is self-impregnated; and the shell, which the animal soon acquires, serves it for its future habitation. Like the muscle, it opens its shell to receive the influx of water, and like that animal, is strongly attached to its shells both above and below.

The oyster differs from the muscle in being utterly unable to change its situation. It is entirely without that tongue which we saw answering the purposes of an arm in the other animal; but nevertheless is often attached very firmly to any object it happens to approach. Nothing is so common in the rivers of the tropical climates as to see oysters growing even amidst the branches of the forest. Many trees, which grow along the banks of the stream, often bend their branches into the water, and particularly the mangrove, which chiefly delights in a moist situation. To these the oysters hang in clusters, like apples upon the most fertile tree; and in proportion as the weight of the fish sinks the plant into the water, where it still continues growing, the number of oysters increase, and hang upon the branches. This is effected by means of a glue proper to themselves, which, when it cements, the joining is as hard as the shell, and is broken with equal difficultly.

Oysters usually cast their spawn in May, which at first appears like drops of candle-grease, and sticks to any hard substance it falls upon. These are covered with a shell in two or three days; and in three years the animal is large enough to be brought to market. As they invariably remain in the places where they are laid, and as they grow without any other seeming food than the influx of sea-water, it is the custom at Colchester, and other parts of England, where the tide settles in marshes on land, to pick up great quantities of small oysters along the shore, which when first gathered, seldom exceed the size of a sixpence. These are deposited in beds where the tide comes in, and in two or three years grow to a tolerable size. They are said to be better tasted for being thus sheltered from the agitation of the deep; and a mixture of fresh water entering into these repositories, is said to improve their flavour, and to increase their growth and fatness.

The oysters, however, which are prepared in this manner, are by no means so large as those found sticking to rocks at

the bottom of the sea, usually called rock-oysters. These are sometimes found as broad as a plate, and are admired by some as excellent food. But what is the size of these compared to the oysters of the East Indies, some of whose shells we have seen two feet over! The oysters found along the coast of Coromandel are capable of furnishing a plentiful meal to eight or ten men; but it seems universally agreed that they are no way comparable to ours for delicacy or flavour.

Thus the muscle and the oyster appear to have but few distinctions, except in their shape, and the power of motion in the former. Other bivalved shell-fish, such as the COCKLE, the SCALLOP, and the RAZOR-SHELL, have differences equally minute. The power of changing place, which some of them effect in a manner quite peculiar to themselves, makes their greatest difference.

The *scallop* is particularly remarkable for its method of moving forward upon land, or swimming upon the surface of the water. When this animal finds itself deserted by the tide, it makes very remarkable efforts to regain the water, moving towards the sea in a most singular manner. It first gapes with its shell as widely as it can, the edges being often an inch asunder; then it shuts them with a jerk, and by this the whole animal rises five or six inches from the ground. It thus tumbles any way forward, and then renews the operation until it has attained its journey's end. When in the water it is capable of supporting itself upon the surface; and there opening and shutting its shells, it tumbles over and over, and makes its way with some celerity.

The *Pivot*, or *Razor-Shell* has a very different kind of motion. As the former moves laboriously and slowly forward, so the razor-shell has only a power of sinking point downward. The shells of this animal resemble nothing so much as the haft of a razor; and by this form it is better enabled to dive into the soft sand at the bottom. All the motions of this little animal are confined to sinking or rising a foot downwards or upwards in the sand, for it never leaves the spot where first it was planted. From time to time it is seen to rise about half way out of its hole; but if any way disturbed, it sinks perpendicularly down again. Just over the place where the razor buries itself, there is a small hole like a chimney, through which the animal breathes, or imbibes the sea-water. Upon the desertion of the tide, these holes are easily distinguished by the fishermen who seek for it; and their method of enticing the razor up from the depth of its retreat is, by sprinkling a little sea-salt upon the whole. This melting no sooner reaches the razor below, than it rises instantly straight upwards, and

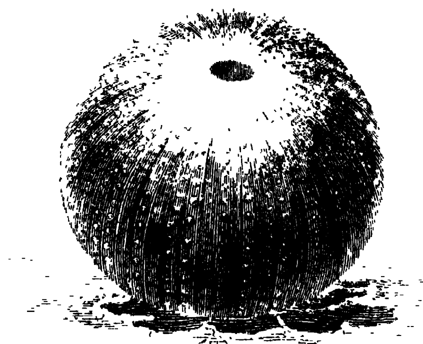
shews about half its length above the surface. This appearance, however, is instantaneous; and, if the fisher does not seize the opportunity, the razor buries itself, with great ease, to its former depth. There it continues secure; no salt can allure it a second time; but it remains unmolested, unless the fisher will be at the trouble of digging it out sometimes two feet below the surface.

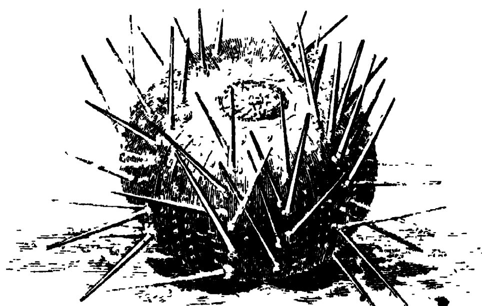
Such are the minute differences between bivalved shell-fish; but in the great outlines of their nature they exactly resemble each other. It is particularly in this class of shell-fish that pearls are found in greatest abundance. The pearl seems bred from no disorder in the animal, but accidentally produced by the same matter that goes to form the shell. This substance, which is soft at first, uickly hardens; and thus, by successive coats, layer over layer, the pearl acquires its dimensions. If cut through, it will be found to consist of several coats, like an onion; and sometimes a small speck is seen in the middle, upon which the coats were originally formed.

All oysters, and most shell-fish, are found to contain pearls; but that which particularly obtains the name of the pearl oyster has a large strong whitish shell, wrinkled and rough without, and within smooth, and of a silver colour. From these the mother-of-pearl is taken, which is nothing more than the internal coats of the shell, resembling the pearl in colour and consistence. There are a great number of pearl fisheries in America and Asia. The chief of these is carried on in the Persian Gulph.

The wretched people that are destined to fish for pearls, are either negroes, or some of the poorest of the natives of Persia. The divers are not only subject to the dangers of the deep, to tempests, to suffocation at the bottom, to being devoured by sharks, but from their profession universally labour under a spitting of blood, occasioned by the pressure of air upon their lungs in going down to the bottom. The most robust and healthy young men are chosen for this employment, but they seldom survive it above five or six years. Their fibres become rigid; their eye-balls turn red; and they usually die consumptive.

It is amazing how very long they are seen to continue at the bottom. Some, as we are assured, have been known to continue three quarters of an hour under water without breathing; and to one unused to diving, ten minutes would suffocate the strongest. They fish for pearls, or rather the oysters that contain them, in boats twenty-eight feet long; and of these there are sometimes three or four hundred at a time: with each seven or eight stones, which serve for anchors.







1 & 2. Sea Urchins 3. Crocodiles Egg

There are from five to eight divers belonging to each, that dive one after another. They are quite naked except that they have a net hanging down from the neck to put their oysters in, and gloves on their hands to defend them while they pick the oysters from the holes in the rocks; for in this manner alone can they be gathered. Every diver is sunk by means of a stone, weighing fifty pounds, tied to the rope by which he descends. He places his foot in a kind of stirrup, and laying hold of the rope with his left hand, with his right he stops his nose to keep in his breath, as upon going down he takes in a very long inspiration. They are no sooner come to the bottom, but they give the signal to those who are in the boat to draw up the stone; which done, they go to work, filling their net as fast as they can; and then, giving another signal, the boats above pull up the net loaded with oysters, and shortly after the diver himself, to take a new inspiration. They dive to the depth of fifteen fathoms, and seldom go deeper. They generally go every morning by break of day to this fatiguing employment, taking the land-wind to waft them out to sea, and returning with the sea-breeze at night. The owners of the boats usually hire the divers, and the rest of the boat's crew, as we do our labourers, at so much a day. All the oysters are brought on shore, where they are laid in a great heap till the pearl fishery is over, which continues during the months of November and December. When opportunity serves, they then examine every oyster; and it is accidental whether the capture turns out advantageous. Indeed, no human being can wish well to a commerce, which thus chains such a number of fellow-creatures to the bottom, to pluck up a glittering, mouldering pebble.

Multivalve Shell-Fish may be considered as animals shut up in round boxes. Of these there are principally two kinds; such as move, and such as are stationary: the first are usually known in our cabinets by the name of sea-eggs; the others are as often admired for the cavities which they scoop out for their habitation in the hardest marble. The first are called, by naturalists, Echini, or Urchins: the latter are called Pholades, or File Fish.

To a slight view, the Sea-Urchin may be compared to the husk of a chesnut; being, like it, round, and with a number of bony prickles standing out on every side. The mouth is placed downwards; the vent is above; the shell is a hollow vase, resembling a scooped apple; and this is filled with a soft, muscular substance, through which the intestines

wind from the bottom to the top. The mouth, which is placed undermost, is large and red, furnished with five sharp teeth, which are easily discerned. The jaws are strengthened by five small bones, in the centre of which is a small fleshy tongue; and from this the intestines make a winding of five spires, round the internal sides of the shell, ending at top, where the excrements are excluded. But what makes the most extraordinary part of this animal's conformation, are its horns and its spines, that point from every part of the body, like the horns of a snail, and that serve at once as legs to move upon, as arms to feel with, and as instruments of capture and defence. Between these horns it has also spines, that are not endued with such a share of motion. The spines and the horns issue from every part of its body; the spines being hard and prickly; the horns being soft, longer than the spines, and never seen except in the water. They are put forward and withdrawn, like the horns of a snail, and are hid at the basis of the spines, serving, as was said before, for procuring food and motion. All this apparatus, however, is only seen when the animal is hunting its prey at the bottom of the water; for a few minutes after it is taken, all the horns are withdrawn into the body, and most of the spines drop off.

It is generally said of insects, that those which have the greatest number of legs always move the slowest: but this animal seems to be an exception to the rule; for though furnished with two thousand spines, and twelve hundred horns, all serving for legs, and from their number seeming to impede each other's motion, yet it runs with some share of swiftness at the bottom, and it is sometimes no easy matter to overtake it. It is often taken upon the ebb, by following it in shallow water, either in an osier basket, or simply with the hand. Both the spines and the horns assist its motion; and the animal is usually seen running with the mouth downward.

Some kinds of this animal are as good eating as the lobster; and its eggs, which are of a deep red, are considered as a very great delicacy. But of others the taste is but indifferent; and, in all places, except the Mediterranean, they are little sought for, except as objects of curiosity.

Very different in motion, though not much different in shape from these, are the ACORN shell-fish, the THUMB-FOOTED shell-fish, and the IMAGINARY BARNACLE. These are fixed to one spot, and appear to vegetate from a stalk. Indeed, to an inattentive spectator, each actually seems to be a kind of fungus that grows in the deep, destitute of animal life as well as motion. But the inquirer will soon change his

opinion, when he comes to observe this mushroom-like figure more minutely. He will then see that the animal residing within the shell has not only life, but some degree of voraciousness. They are seen adhering to every substance that is to be met with in the ocean; rocks, roots of trees, ships' bottoms, whales, lobsters, and even crabs; like bunches of grapes clung to each other. It is amusing enough to behold their operations.* They for some time remain motionless within their shell; but when the sea is calm, they are seen opening the lid, and peeping about them, they then thrust out their long neck, look round them for some time, and abruptly retreat back into their box, shut their lid, and lurk in darkness and security. Some people eat them; but they are in no great repute at the tables of the luxurious, where their deformed figure would be no objection to their being introduced.

Of all animals of the shelly tribe, the PHOLADES are the most wonderful. These animals are found in different places; sometimes clothed in their proper shell, at the bottom of the water; sometimes concealed in lumps of marly earth; and sometimes lodged, shell and all, in the body of the hardest marble. In their proper shell they assume different figures; but, in general, they somewhat resemble a muscle, except that their shell is found actually composed of five or more pieces, the smaller valves serving to close up the openings left by the irregular meeting of the two principal shells. But their penetration into rocks, and their residence there, makes up the most wonderful part of their history.

This animal, when divested of its shell, resembles a roundish, soft pudding, with no instrument that seems in the least fitted for boring into stones, or even penetrating the softest substance. It is furnished with two teeth indeed; but these are placed in such a situation, as to be incapable of touching the hollow surface of its stony dwelling: it has also two covers to its shell, that open and shut at either end; but these are totally unserviceable to it as a miner. The instrument with which it performs all its operations, and buries itself in the hardest rocks, is only a broad fleshy substance, somewhat resembling a tongue, that is seen issuing from the bottom of its shell. With this soft, yielding instrument, it perforates the most solid marbles; and having, while yet little and young, made its way by a very narrow entrance into the substance of the stone, it then begins to grow bigger, and thus to enlarge its apartment.

* Anderson's History of Greenland.

When it has buried its body in a stone, it there continues for life at its ease; the sea-water that enters at the little aperture supplying it with luxurious plenty. When the animal has taken too great a quantity of water, it is seen to spurt it out of its hole with some violence. Upon this seemingly thin diet it quickly grows larger, and soon finds itself under a necessity of enlarging its habitation and its shell. The motion of the Pholas is slow beyond conception; its progress keeps pace with the growth of its body; and in proportion as it becomes larger, it makes its way farther into the rock. When it has got a certain way in, it then turns from its former direction, and hollows downward; till at last, when its habitation is completed, the whole apartment resembles the bowl of a tobacco pipe; the hole in the shank being that by which the animal entered.

But they are not supplied only with their rocky habitation; they have also a shell to protect them; this shell grows upon them in the body of the rock, and seems a very unnecessary addition to that defence, which they have procured themselves by art. These shells take different forms, and are often composed of different number of valves; sometimes six; sometimes but three; sometimes the shell resembles a tube with holes at either end, one for the mouth, and the other for voiding the excrements.

This animal is found in greatest numbers at Ancona, in Italy; it is found along the shores of Normandy and Poictiers, in France: it is found also upon some of the coasts of Scotland; and, in general, is considered a very great delicacy at the tables of the luxurious.

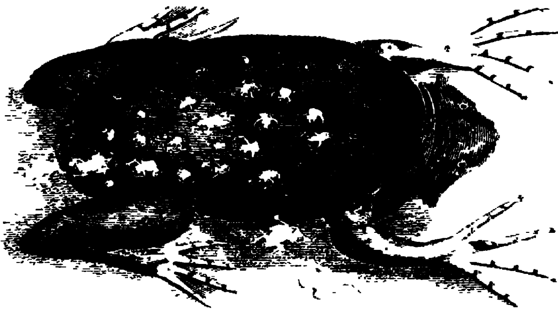
CHAP. XXXIII.

Of Reptiles—The FROG—*The Toad—Varieties—Surinam Toad—Of* LIZARDS—*The Crocodile and Alligator—The open-bellied Crocodile—The Salamander—The Cordyle, &c.—The Iguana—The Chameleon—The Dragon—The Siren—The Tarantula—The Chalcidian Lizard.*

IF we emerge from the deep, the first and most obvious class of amphibious animals that occur upon land are Frogs and Toads.

To describe the form of animals, so well known, would be superfluous; to mark those differences that distinguish them







1. Frog. _ 2. Pipal or Surinam Toad:
3. Chalcidian Lizard:

from each other, may be necessary. The frog moves by leaping; the toad crawls along the ground: the frog is in general less than the toad; its colour is brighter, and with a more polished surface: the toad is brown, rough, and dusty. The frog is light and active, and its belly comparatively small; the toad is slow, swollen, and incapable of escaping. The frog, when taken, contracts itself so as to have a lump on its back; the toad's back is straight and even. Their habitudes and manners exhibit a greater variety, and require a separate description.

The external figure of the frog is too well known to need a description. Its power of taking large leaps is remarkably great, compared to the bulk of its body: and it is the best swimmer of all four-footed animals.

If we examine this animal internally, we shall find that it has very little brain for its size; a very wide swallow; a stomach seemingly small, but capable of great distension. The heart in the frog, as in all other animals that are truly amphibious, has but one ventricle; so that the blood can circulate without the assistance of the lungs while it keeps under water. The lungs resemble a number of small bladders joined together, like the cells of a honey-comb: they are connected to the back by muscles, and can be distended or exhausted at the animal's pleasure. Neither male nor female have any of the external instruments of generation; the anus serving for that purpose in both. Such are the most striking peculiarities in the anatomy of a frog; and in these it agrees with the toad, the lizard, and the serpent.

The female is impregnated neither by the mouth, as some philosophers imagine, nor by the excrescence at the thumbs, as was the opinion of Linnæus; but by the inspersion of the male seminal fluid upon the eggs as they proceed from the body.

A single female produces from six to eleven hundred eggs at a time; and, in general, she throws them all out together by a single effort; though sometimes she is an hour in performing this task.

When the spawn is emitted and impregnated by the male, it drops to the bottom. The eggs, which during the four first hours suffer no perceptible change, begin then to enlarge and grow lighter; by which means they mount to the surface of the water. The twenty-first day the egg is seen to open a little on one side, and the beginning of a tail to peep out, which becomes a more and more distinct every day. The thirty-ninth day the little animal begins to have motion; it moves at intervals its tail; and it is perceived that the

liquor in which it is circumfused, serves it for nourishment. In two days more, some of these little creatures fall to the bottom; while others remain swimming in the fluid round them, while their vivacity and motion seem to increase. Those which fall to the bottom remain there the whole day; but having lengthened themselves a little, for hitherto they are doubled up, they mount at intervals, to the mucus, which they had quitted, and are seen to feed upon it with great vivacity. The next day they acquire their tadpole form. In three days more they are perceived to have two little fringes, that serve as fins beneath the head; and these in four days after assume a more perfect form. It is then also that they are seen to feed very greedily upon the pond-weed. When ninety-two days old, two small feet are seen beginning to shew near the tail; and the head appears to be separate from the body. In five days after this, they refuse all vegetable food; their mouth appears furnished with teeth; and their hinder legs are completely formed. In this state it continues for about six or eight hours; and then the tail dropping off by degrees, the animal appears in its most perfect form.

Thus the frog, in less than a day, having changed its figure, is seen to change its appetites also. As soon as the animal acquires its perfect state, from having fed upon vegetable it becomes carnivorous, and lives entirely upon worms and insects. But, as the water cannot supply these, it is obliged to quit its native element, and seek for food upon land, where it lives by hunting worms and taking insects by surprise.

The frog lives for the most part out of the water; but when the cold nights begin to set in, it returns to its native element, always choosing stagnant waters, where it can lie without danger, concealed at the bottom. In this manner it continues torpid, or with but very little motion, all the winter; like the rest of the dormant race, it requires no food: and the circulation is slowly carried on without any assistance from the air.

The difference of sexes, which was mentioned above, is not perceivable in these animals, until they have arrived at their fourth year; nor do they begin to propagate, till they have completed that period. By comparing their slow growth with their other habitudes, it would appear, that they live about twelve years; but having so many enemies, both by land and water, it is probable that few of them arrive at the end of their term.

Frogs live upon insects of all kinds; but they never eat any, unless they have motion. They continue fixed and immoveable till their prey appears; and just when it comes suffi-

ciently near, they jump forward with great agility, dart out their tongues, and seize it with certainty. The tongue in this animal, as in the toad, lizard, and serpent, is extremely long, and formed in such a manner that it swallows the point down its throat; so that a length of tongue is thus drawn out, like a sword from its scabbard, to assail its prey. This tongue is furnished with a glutinous substance; and whatever insect it touches infallibly adheres, and is thus held fast till it is drawn into the mouth.

The croaking of frogs is well known; whence in some countries they are distinguished by the ludicrous title of Dutch Nightingales. The large water or *bull frogs*, of the northern countries have a note as loud as the bellowing of a bull; and, for this purpose, puff up the cheeks to a surprising magnitude. Of all frogs, however, the male only croaks; the female is silent; before wet weather, their voices are in full exertion; they are then heard with unceasing assiduity, sending forth their call, and welcoming the approaches of their favourite moisture. No weather-glass was ever so true as a frog, in foretelling an approaching change. This may probably serve to explain an opinion which some entertain, that there is a month in the year, called Paddock Moon, in which the frogs never croak: the whole seems to be no more than that, in the hot season, when the moisture is dried away, and consequently, when these animals neither enjoy the quantity of health nor food that at other times they are supplied with, they shew by their silence how much they are displeased with the weather.

As frogs adhere closely to the backs of their own species, so it has been found, by repeated experiments, they will also adhere to the backs of fishes. Few that have ponds, but know that these animals will stick to the backs of carp, and fix their fingers in the corner of each eye. In this manner they are often caught together; the carp blinded, and wasted away.

The *Toad.* If we regard the figure of the toad, there seems nothing in it that should disgust more than that of the frog. Its form and proportions are nearly the same; and it chiefly differs in colour, which is blacker; and its slow and heavy motion, which exhibits nothing of the agility of the frog: yet such is the force of habit, begun in early prejudice, that those who consider the one as an harmless, playful animal, turn from the other with horror and disgust. The frog is considered as a useful assistant in ridding our grounds of vermin, the toad as a secret enemy that only wants an opportunity to infect us with its venom.

As the toad bears a general resemblance in figure to the frog, so also it resembles that animal in its nature and appetites. When, like the frog, these animals have undergone all the variations of their tadpole state, they forsake the water, and are often seen, in a moist summer's evening, crawling up, by myriads, from fenny places, into drier situations. There, having found out a retreat, or having dug themselves one with their mouth and hands, they lead a patient solitary life, seldom venturing out, except when the moisture of a summer's evening invites them abroad. At that time the grass is filled with snails, and the pathways covered with worms, which make their principal food. Insects also, of every kind, they are fond of; and we have the authority of Linnæus for it, that they sometimes continue immoveable, with the mouth open, at the bottom of shrubs, where the butterflies, in some measure fascinated, are seen to fly down their throats.

In a letter from Mr. Arscott, there are some curious particulars relating to this animal, which throw great light upon its history. "Concerning the toad," says he, "that lived so many years with us, and was so great a favourite, the greatest curiosity was its becoming so remarkably tame: it had frequented some steps before our hall door some years before my acquaintance commenced with it, and had been admired by my father for its size (being the largest I ever met with) who constantly paid it a visit every evening. I knew it myself above thirty years; and by constantly feeding it, brought it to be so tame, that it always came to the candle and looked up, as if expecting to be taken up and brought upon the table, where I always fed it with insects of all sorts. It was fondest of flesh maggots, which I kept in bran; it would follow them, and when within a proper distance, would fix his eyes, and remain motionless, for near a quarter of a minute, as if preparing for the stroke, which was an instantaneous throwing of its tongue at a great distance upon the insect, which stuck to the tip by a glutinous matter. The motion is quicker than the eye can follow. I cannot say how long my father had been acquainted with the toad, before I knew it; but when I was first acquainted with it, he used to mention it as the old toad I have known so many years. I can answer for thirty-six years. This old toad made its appearance as soon as the warm weather came; and I always concluded it retired to some dry bank, to repose till spring. When we new laid the steps, I had two holes made in the third step, on each side, with a hollow of more than a yard long for it; in which I imagine it

slept, as it came thence at its first appearance. It was seldom provoked. Neither that toad, nor the multitudes I have seen tormented with great cruelty, ever shewed the least desire of revenge, by spitting or emitting any juice from their pimples. Sometimes, upon taking it up, it would let out a great quantity of clear water, which, as I have often seen it to do the same upon the steps when quite quiet, was certainly its urine, and no more than a natural evacuation. Spiders, millepedes, and flesh maggots, seem to be this animal's favourite food. I imagine if a bee were to be put before a toad, it would certainly eat it to its cost*; but as bees are seldom stirring at the same time that toads are, they rarely come in their way: as they do not appear after sun-rising, or before sun-set. In the heat of the day they will come to the mouth of their hole, I believe, for air. I once, from my parlour window, observed a large toad I had in the bank of a bowling-green, about twelve at noon, a very hot day, very busy and active upon the grass. So uncommon an appearance made me go out to see what it was; when I found an innumerable swarm of winged ants had dropped round his hole; which temptation was as irresistible as a turtle would be to a luxurious alderman. In respect to its end, had it not been for a tame raven, I make no doubt but it would have been now living. This bird, one day seeing it at the mouth of its hole, pulled it out, and although I rescued it, pulled out one eye, and hurt it so, that, notwithstandtng its living a twelve-month, it never enjoyed itself, and had a difficulty of taking its food, missing the mark for want of its eye. Before that accident, it had all the appearance of perfect health."

The toad, contrary to vulgar prejudice, is an harmless, defenceless creature, torpid and unvenomous, and seeking the darkest retreats, not from the malignity of its nature, but the multitude of its enemies.

Like all of the frog kind, the toad is torpid in winter. It chooses then for a retreat either the hollow root of a tree, the cleft of a rock, or sometimes the bottom of a pond, where it is found in a state of seeming insensibility. As it is very long-lived, it is very difficult to be killed; its skin is tough, and cannot be easily pierced; and, though covered with wounds, the animal continues to shew signs of life, and every part appears in motion. But what shall we say to its living for centuries lodged in the bosom of a rock, or cased within

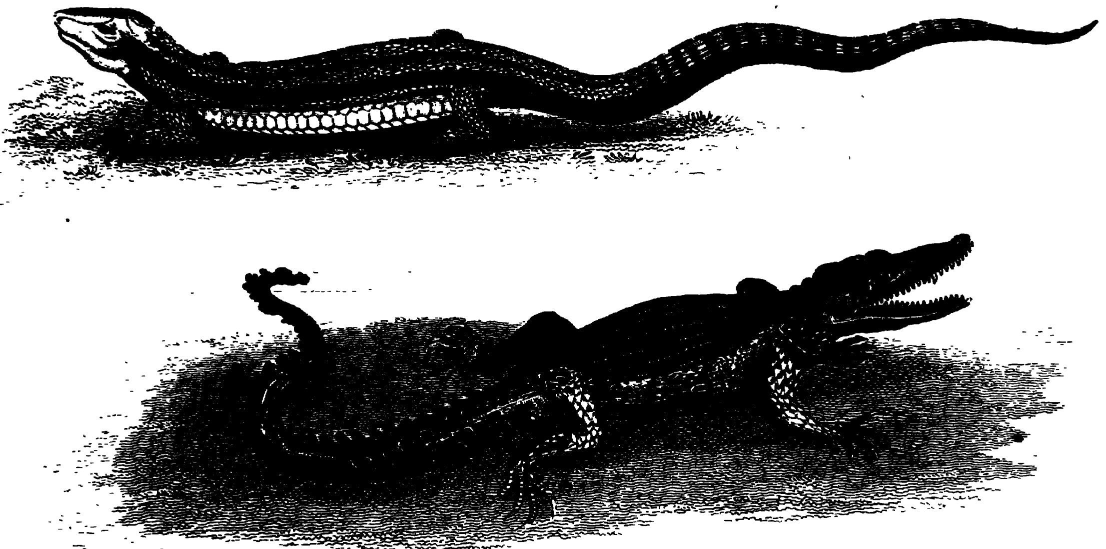
* Ræsel tried a frog; it swallowed the bee alive; its stomach was stung, and the animal vomited it up again.

the body of an oak tree, without the smallest access on any side, either for nourishment or air, and yet taken out alive and perfect! Stories of this kind it would be as rash to contradict, as it is difficult to believe; we have the highest authorities bearing witness to their truth, and yet the whole analogy of nature seems to arraign them of falsehood. Bacon asserts, that toads are found in this manner; Dr. Plot asserts the same; there is to this day, a marble chimney-piece at Chatsworth with the print of the toad upon it, and tradition of the manner in which it was found. In the Memoirs of the Academy of Sciences, there is an account of a toad found alive and healthy in the heart of a very thick elm, without the smallest entrance or egress*. In the year 1731, there was another found near Nantz, in the heart of an old oak, without the smallest issue to its cell; and the discoverer was of opinion, from the size of the tree, that the animal could not have been confined there less than eighty or a hundred years, without sustenance, and without air.

Of this animal there are several varieties; such as the water and the land toad, which probably differ only in the ground-colour of their skin. In the first, it is more inclining to ash-colour, with brown spots; in the other, the colour is brown, approaching to black. The water-toad is not so large as the other; but both equally breed in that element. The size of the toad with us is generally from two to four inches long; but in the fenny countries of Europe, they are seen much larger; and not less than a common crab. But this is nothing to what they are found in some of the tropical climates, where travellers often, for the first time, mistake a toad for a tortoise. Their usual size is from six to seven inches; but there are some still larger, and as broad as a plate. Of these, some are beautifully streaked and coloured; some studded over, as if with pearls; others bristled with horns or spines; some have the head distinct from the body, while others have it so sunk in, that the animal appears without a head. With us the opinion of its raining toads and frogs has long been justly exploded; but it still is entertained in the tropical countries, and that not only by the savage natives, but the more refined settlers; who are apt enough to add the prejudices of other nations to their own.

It would be a tedious, as well as a useless, task to enter into all the minute discriminations of these animals, as found in different countries or places; but the *Pipal*, or the *Surinam Toad*, is too strange a creature not to require an exact description.

* Vide the Year 1719



1. Scaly Lizard. 2. Crocodile

This animal is in form more hideous than even the common toad. The body is flat and broad; the head small; the jaws, like those of the mole, are extended, and evidently formed for rooting in the ground; the skin of the neck forms a sort of wrinkled collar; are colour of the head is of a dark chesnut, and the eyes are small: the back, which is very broad, is of a lightish grey, and seems covered over with a number of small eyes, which are round, and placed at nearly equal distances. These eyes are very different from what they seem; they are the animal's eggs covered with their shells, and placed there for hatching. These eggs are buried deep in the skin, and in the beginning of gestation but just appear; and are very visible when the young animal is about to burst from its confinement. They are of a reddish, shining yellow colour; and the spaces between them are full of small warts, resembling pearls.

In this manner the Pipal is seen travelling with her wondrous family on her back, in all the different stages of maturity. Some of the strange progeny not yet come to sufficient perfection, appear quite torpid, and as yet without life in the egg: others seem just beginning to rise through the skin; here peeping forth from the shell, and there having entirely forsaken their prison: some are sporting at large upon their parent's back; and others descending to the ground, to try their own fortune below.

Of Lizards. It is no easy matter to tell to what class in nature lizards are chiefly allied. They are unjustly raised to the rank of beasts, as they bring forth eggs, dispense with breathing, and are not covered with hair. They cannot be placed among fishes, as the majority of them live upon the land: they are excluded from the serpent tribe, by their feet, upon which they run with some celerity; and from the insects, by their size; for though the newt may be looked upon in this contemptible light, a crocodile would be a terrible insect indeed.

As lizards thus differ from every other class of animals, they also differ widely from each other. With respect to size, no class of beings has its ranks so opposite.

The colour of these animals also is very various; as they are found of a hundred different hues: green, blue, red, chesnut, yellow, spotted, streaked, and marbled. Were colour alone capable of constituting beauty, the lizard would often please; but there is something so repressing in the animal's figure, that the brilliancy of its scales, or the variety of its sports, only tend to give an air of more exquisite venom of

greater malignity. The figure of these animals is not less various; sometimes swollen in the belly, sometimes, pursed up at the throat; sometimes with a rough set of spines on the back, like the teeth of a saw; sometimes with teeth, at others with none; sometimes venomous, at others harmless, and even philanthropic: sometimes smooth and even; sometimes with a long, slender tail; and often with a shorter blunt one.

But their greatest distinction arises from their manner of bringing forth their young: some of them are viviparous; some are oviparous; and some bring forth small spawn, like fishes.

The only animals of this genus which are common in Great Britain, are the *Scaly Lizard*, which is about six inches in length; the *Brown Lizard*, or *Eft*, which is about three inches long; and the *Warty Lizard*, or *Salamander*, of which we shall presently treat more at large.

The *Crocodile* is an animal placed at a happy distance from the inhabitants of Europe, and formidable only in those regions where men are scarce, and arts are but little known. In all the cultivated and populous parts of the world, the great animals are entirely banished or rarely seen. The appearance of such raises at once a whole country up in arms to oppose their force; and their lives generally pay the forfeit of their rashness.

To look for this animal in all its natural terrors, grown to an enormous size, propagated in surprising numbers, and committing unceasing devastations, we must go to the uninhabited regions of Africa and America, to those immense rivers that roll through extensive and desolate kingdoms, where arts have never penetrated, where force only makes distinction, and the most powerful animals exert their strength with confidence and security.

Of this terrible animal there are two kinds; the crocodile, properly so called, and the cayman or alligator. Travellers, however, have rather made the distinction than Nature; for in the general outline, and in the nature of these two animals, they are entirely the same. The distinctions usually made between the crocodile and alligator are these: the body of the crocodile is more slender than that of the alligator; its snout runs off tapering from the forehead, like that of a greyhound; while that of the other is indented, like the nose of a lap-dog. The crocodile has also a much wider swallow, and is of an ash-colour.

This animal grows to a great length, being sometimes found thirty feet long, from the tip of the snout to the end of the tail; its most usual length, however, is eighteen. One which

was dissected by the Jesuits at Siam, was eighteen feet and a half, French measure, in length; of which the tail was no less than five feet and a half, and the head and neck above two feet and a half. It was four feet nine inches in circumference, where thickest. The fore-legs had the same parts and conformation as the arms of a man both within and without. The hands, if they may be so called, had five fingers; the two last of which had no nails, and were of a conical figure. The hinder legs, including the thigh and paw, were two feet two inches long; the paws, from the joint to the extremity of the longest claws, were about nine inches; they were divided into four toes, of which three were armed with large claws, the longest of which was an inch and a half; these toes were united by a membrane, like those of a duck, but much thicker. The head was long, and had a little rising at the top; but the rest was flat, and especially towards the extremity of the jaws. It was covered by a skin, which adhered firmly to the skull and to the jaws. The skull was rough and unequal in several places. The eye was very small in proportion to the rest of the body. The jaws seemed to shut one upon the other; and nothing can be more false than that the animal's under jaw is without motion; it moves, like the lower jaw in all other animals, while the upper is fixed to the skull, and absolutely immoveable. The animal had twenty-seven cutting teeth in the upper jaw, and fifteen in the lower, with several void spaces between them. The distance of the two jaws, when opened as wide as they could be, was fifteen inches and a half; this is a very wide yawn, and could easily enough take in the body of a man. From the shoulders to the extremity of the tail, the animal was covered with large scales, of a square form, disposed like parallel girdles. The creature was covered not only with these, but all over with a coat of armour; which, however, was not proof against a musquet ball, contrary to what has been commonly asserted. It had no bladder; but the kidneys sent the urine to be discharged by the anus. There were sixty-two joints in the back-bone,' which, though very closely united, had sufficient play to enable the animal to bend like a bow to the right and the left; so that what we hear of escaping the creature by turning out of the right line, and of the animal's not being able to wheel readily after its prey, seems to be fabulous.

Such is the figure and conformation of this formidable animal, that depopulates countries, and makes the most navigable rivers desert and dangerous. They are seen in some places,

lying for whole hours, and even days, stretched in the sun, and motionless; so that one not used to them, might mistake them for trunks of trees, covered with a rough and dry bark; but the mistake would soon be fatal, if not prevented: for the torpid animal, at the near approach of any living thing, darts upon it with instant swiftness, and at once drags it down to the bottom. In the times of an inundation, they sometimes enter the cottages of the natives, where the dreadful visitant seizes the first animal it meets with. There have been several examples of their taking a man out of a canoe in the sight of his companions, without their being able to lend him any assistance.

The strength of every part of the crocodile is very great; and its arms, both offensive and defensive, irresistible. Most naturalists have remarked, from the shortness of its legs, the amazing strength of the tortoise: but what is the strength of such an animal, compared to that of the crocodile, whose legs are very short, and whose size is so superior? Its principal instrument of destruction is the tail: with a single blow of this it has often overturned a canoe, and seized upon the poor savage, its conductor.

Though not so powerful, yet it is very terrible even upon land. The crocodile seldom, except when pressed by hunger, or with a view of depositing its eggs, leaves the water. Its usual method is to float along upon the surface, and seize whatever animals come within its reach; but when this method fails, it then goes closer to the bank. Disappointed of its fishy prey, it there waits, covered up among the sedges, in patient expectation of some land animal that may come to drink; the dog, the bull, the tiger, or man himself. Nothing is to be seen of the insidious destroyer as the animal approaches; nor is its retreat discovered till it be too late for safety. It seizes the victim with a spring, and goes at a bound much faster than so unwieldy an animal could be thought capable of; then, having secured the creature with both teeth and claws, it drags it into the water, instantly sinks with it to the bottom, and in this manner quickly drowns it.

Sometimes it happens that the creature the crocodile has thus surprised, escapes from its grasp wounded, and makes off from the river-side. In such a case, the tyrant pursues with all its force, and often seizes it a second time; for, though seemingly heavy, the crocodile runs with great celerity. In this manner it is sometimes seen above half a mile from the bank, in pursuit of an animal wounded beyond the power of escaping, and then dragging it back to the river-side, where it feasts in security.

It often happens, in its depredations along the bank, that the crocodile seizes on a creature as formidable as itself, and meets with the most desperate resistance. We are told of frequent combats between the crocodile and the tiger. All creatures of the tiger kind are continually oppressed by a parching thirst, that keeps them in the vicinity of great rivers, whither they descend to drink very frequently. It is upon these occasions that they are seized by the crocodile; and they die not unrevenged. The instant they are seized upon, they turn with the greatest agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagonist into the river. There they continue to struggle for some time, till at last the tiger is drowned.

In this manner the crocodile seizes and destroys all animals, and is equally dreaded by all. There is no animal, but man alone, that can combat it with success. We are assured by Labat, that a negro, with no other weapon than a knife in his hand, and his left arm wrapped round with a cow's hide, ventures boldly to attack the animal in his own element. As soon as he approaches the crocodile, he presents his left arm, which the animal swallows most greedily; but sticking in his throat, the negro has time to give it several stabs under the throat; and the water also getting in at the mouth, which is held involuntarily open, the creature is soon bloated up as big as a tun, and expires.

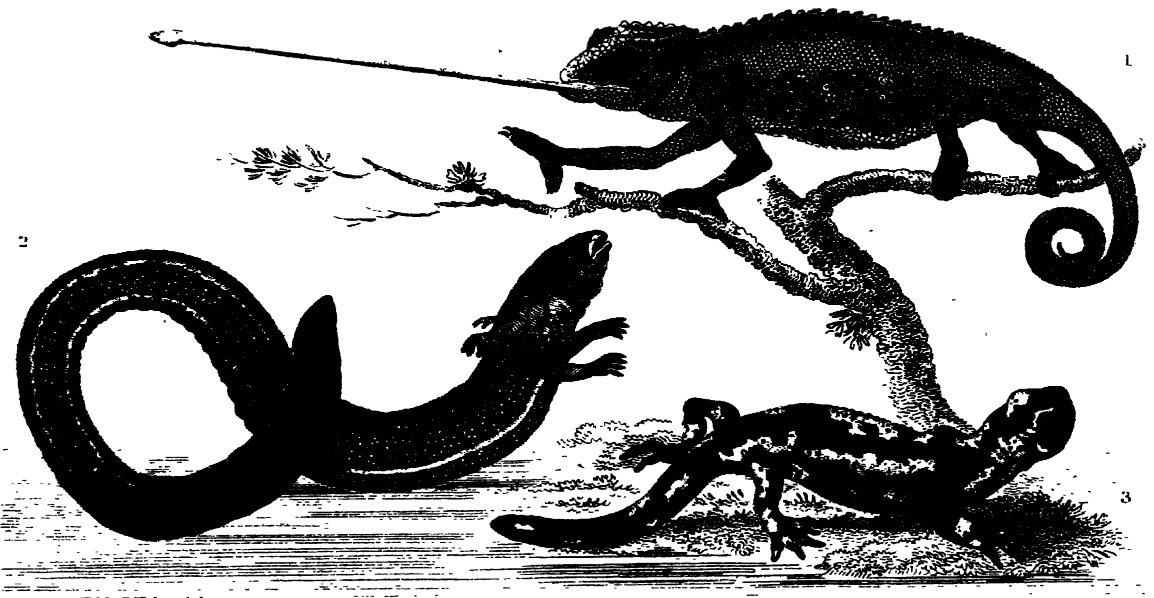
Whatever be the truth of these accounts, certain it is that crocodiles are taken by the Siamese in great abundance. The manner of taking them is by throwing three or four strong nets across a river, at proper distances from each other; so that, if the animal breaks through the first, it may be caught by one of the rest. When it is first taken, it employs its tail with great force; but, after many unsuccessful struggles, it is at last exhausted. Then the natives approach their prisoner in boats, and pierce him with their weapons in the most tender parts, till he is weakened with the loss of blood. When he has done stirring, they begin by tying up his mouth, and with the same cord, they fasten his head to his tail; which last they bend back like a bow. They are not, however, yet perfectly secure from his fury; but, for their greater safety, they tie his fore feet, as well as those behind, to the top of his back.

The crocodile, thus brought into subjection, or bred up young, is used to divert and entertain the great men of the East. It is often managed like a horse: a curb is put into its mouth, and the rider directs it as he thinks proper. Though awkwardly formed, it does not fail to proceed with some degree of swiftness, and is thought to move as fast as some of the most unwieldy of our own animals, the hog, or the cow.

Along the rivers of Africa this animal is sometimes taken in the same manner as the shark. Several Europeans go together in a large boat, and throw out a piece of beef upon a hook and strong fortified line, which the crocodile seizing and swallowing, is drawn along, floundering and struggling, until its strength is quite exhausted, when it is pierced in the belly, which is its tenderest part; and thus, after numberless wounds, is drawn ashore. In this part of the world also, as well as at Siam, the crocodile makes an object of savage pomp, near the palaces of their monarchs. Philips informs us, that at Sabi, on the Slave Coast, there are two pools of water near the royal palace, where crocodiles are bred, as we breed carp in our ponds in Europe.

There is a very powerful smell of musk about all these animals. Travellers are not agreed in what part of the body these musk-bags are contained; but the most probable opinion is, that this substance is amassed in glands under the legs and arms. The crocodile's flesh is, at best, very bad, tough eating; but, unless the musk-bags be separated, it is insupportable. The negroes themselves cannot well digest the flesh; but a crocodile's egg is to them the most delicate morsel in the world.

All crocodiles breed near fresh waters; and for this purpose the female, when she comes to lay, chooses a place by the side of a river, or some fresh-water lake, to deposit her brood in. She always pitches upon an extensive sandy shore, where she may dig a hole without danger of detection from the ground being fresh turned up. There she deposits from eighty to an hundred eggs, of the size of a tennis-ball, and of the same figure, covered with a tough, white skin, like parchment. She takes above an hour to perform this task; and then covering up the place so artfully, that it can scarcely be perceived, she goes back, to return again the next day. Upon her return, with the same precaution as before, she lays about the same number of eggs; and the day following also a like number. Thus, having deposited her whole quantity, and having covered them close up in the sand, they are soon vivified by the heat of the sun; and at the end of thirty days the young ones begin to break open the shell. At this time, the female is instinctively taught that her young ones want relief; and she goes upon land, to scratch away the sand, and set them free. Her brood quickly avail themselves of their liberty; a part run unguided to the water; another part ascend the back of the female, and are carried thither in greater safety. But the moment they arrive at the water all natural connection is at an end. The whole brood scatters into different parts of the bottom; by far the



1. Camelion. 2. Siren. 3. Salamander.

greatest number are destroyed: and the rest find safety in their agility or minuteness.

The open-bellied crocodile is furnished with a false belly, like the oppossum, where the young creep out and in, as their dangers and necessities require. It is probable that this open-bellied crocodile is viviparous, and fosters her young that are prematurely excluded, in this second womb, until they come to proper maturity.

The *Salamander*. The ancients have described a lizard that is bred from heat, that lives in the flames, and feeds upon fire, as its proper nourishment. It will be needless to say that there is no such animal existing; and that, above all others, the modern salamander has the smallest affinity to such an animal.

There has been not less than seven sorts of this animal described by Seba; and to have some idea of the peculiarity of their figure, if we suppose the tail of a lizard applied to the body of a frog, we shall not be far from precision.

But it is not in figure that this animal chiefly differs from the rest of the lizard tribe. In conformation it is unlike, as the salamander is produced alive from the body of its parent, and is completely formed the moment of its exclusion. It differs from them also in its general reputation of being venomous; no trials, however, that have been hitherto made, seem to confirm the truth of the report.

The salamander best known in Europe, is from eight to eleven inches long; usually black, spotted with yellow; and, when taken in the hand, feeling cold to a great degree. There are several kinds. Our black *water newt* is reckoned among the number. The idle report of its being inconsumable by fire, has caused many of these poor animals to be burnt; but we cannot say as philosophical martyrs, since scarce any philosopher would think it necessary to make the experiment. When thrown into the fire, the animal is seen to burst with the heat of its situation, and to eject its fluids. We are gravely told in the Philosophical Transactions, that this is a method the animal takes to extinguish the flames.

The whole of the lizard kind are so tenacious of life, that they will live several hours after the loss of their head: they also sustain the want of food in a surprising manner. One of them, brought from the Indies, lived nine months without any other food than what it received from licking a piece of earth, on which it was brought over*; another was kept by Seba, in an empty vial, for six months, without any nourish-

* Phil. Trans. ann. 1661. N. 21. Art. 7.

ment; and Redi talks of a large one, brought from Africa, that lived for eight months, without taking any nourishment whatever. Indeed, as many of this kind, both salamanders and lizards, are torpid, or nearly so, during the winter, the loss of their appetite for so long a time is the less surprising.

Directly descending from the crocodile, in this class, we find the *cordyle*, the *tockay*, and the *tejuguacu*, all growing less in the order in which they are named. These fill up the chasm to be found between the crocodile and the African iguana.

The *Iguana*, which deserves our notice, is about three feet long, and the body about as thick as one's thigh. The skin is covered with small scales, like those of a serpent; and the back is furnished with a row of prickles that stand up, like the teeth of a saw. Both the jaws are full of very sharp teeth, and the bite is dangerous, though not venomous. The male has a skin hanging under his throat, which reaches down to his breast; and when displeased he puffs it up like a bladder: he is one-third larger and stronger than the female, though the strength of either avails them little towards their defence. The males are ash-coloured, and the females are green.

The flesh of these may be considered as the greatest delicacy of Africa and America; and the sportsmen of those climates go out to hunt the iguana, as we do in pursuit of the pheasant or the hare. In the beginning of the season, when the great floods of the tropical climates are passed away, and vegetation starts into universal verdure, the sportsmen are seen, with a noose and a stick, wandering along the sides of the rivers, to take the iguana. This animal, though apparently formed for combat, is the most harmless creature of all the forest; it lives among the trees, or sports in the water, without ever offering to offend. There, having fed upon the flowers of the mahot, and the leaves of the mapou, that grow along the banks of the stream, it goes to repose upon the branches of the trees that hang over the water. Upon land, the animal is swift of foot; but when once in possession of a tree, it seems conscious of the security of its situation, and never offers to stir. There the sportsman easily finds it, and as easily fastens his noose round its neck. If the head be placed in such a manner that the noose cannot readily be fastened, by hitting the animal a blow on the nose with a stick, it lifts the head, and offers it in some measure to the noose. In this manner, and also by the tail, the iguana is dragged from the trees, and killed by repeated blows on the head.

The *Camelcon* is a very different animal; and as the iguana

satisfies the appetites of the epicure, this is rather the feast of the philosopher. Like the crocodile, this little animal proceeds from an egg; and it also nearly resembles that formidable creature in form.

The head of a large chameleon is almost two inches long: and thence to the beginning of the tail, four and a half; the tail is five inches long, and the feet two and a half; the thickness of the body is different at different times; sometimes, from the back to the belly, it is two inches; and sometimes but one; for it can blow itself up, and contract itself at pleasure. This swelling and contraction is not only of the back and belly, but of the legs and tail.

The chameleon has the power of driving the air it breathes over every part of the body: however, it only gets between the skin and the muscles; for the muscles themselves are never swollen. The skin is very cold to the touch; and though the animal seems so lean, there is no feeling the beating of the heart. The surface of the skin is unequal, and has a grain not unlike shagreen, but very soft, because each eminence is as smooth as if it were polished. The colour of all these eminences, when the chameleon is at rest in a shady place, is of a bluish grey: and the space between is of a pale red and yellow.

But when the animal is removed into the sun, then comes the wonderful part of its history. At first, it appears to suffer no change of colour, its greyish spots still continuing the same: but the whole surface soon seems to imbibe the rays of light; and the simple colouring of the body changes into a variety of beautiful hues. Wherever the light comes upon the body, it is of a tawny brown; but that part of the skin on which the sun does not shine, changes into several brighter colours, pale yellow, or vivid crimson; which form spots of the size of half one's finger: some of these descend from the spine half way down the back; and others appear on the sides, arms, and tail. Sometimes the animal becomes all over spotted with brown spots, of a greenish cast. When it is wrapped up in a white linen cloth for two or three minutes, the natural colour becomes much lighter; but not quite white, as some authors have pretended: however, it must not hence be concluded that the chameleon assumes the colour of the objects which it approaches; this is entirely an error, and probably has taken its rise from the continual changes it appears to undergo.

When the chameleon changes place, and attempts to descend from an eminence, it moves with the utmost precaution, advancing one leg very deliberately before the other, still

securing itself by holding whatever it can grasp by the tail. It seldom opens the mouth, except for fresh air; and, when that is supplied, discovers its satisfaction by its motions, and the frequent changes of its colour. The tongue is sometimes darted out after its prey, which are flies; and this is as long as the whole body. The eyes are remarkably little, though they stand out of the head; but the most extraordinary part of their conformation is, that the animal often moves one eye, when the other is entirely at rest; nay, sometimes one eye will seem to look directly forward, while the other looks backward; and one will look upwards, while the other regards the earth.

To this class of lizards we may refer the *Dragon*, a most terrible animal; if we were to credit the invention of fable and superstition. Happily, however, such ravages are no where found to exist at present; and the whole race of dragons is dwindled down to the flying lizard, a little harmless creature, that only preys upon insects, and even seems to embellish the forest with its beauty.

The *Siren* is a creature not less extraordinary. It is the only biped in this class of animals. In Carolina it is called the *Mud Iguana*, as it is chiefly found in muddy and swampy places.

The *Tarantula* is rather famous for the horror which it excites in the inhabitants of Italy, than for any other property. It is a deformed brown lizard, somewhat thicker and rounder than other lizards, and which, like our eft, is found in old walls, or under the ruins of buildings. In perusing the accounts of naturalists and travellers, it will be necessary to observe the distinction between this animal, and the spider which is called tarantula, and of which we shall speak when we come to treat of insects.

The last animal of the lizard kind we shall mention, is the *Chalcidian Lizard*, of Aldrovandus, very improperly called the *Seps*, by modern historians. This animal seems to mark the shade that separates the lizard from the serpent race. It has four legs, like the lizard; but so short, as to be utterly unserviceable in walking; it has a long slender body, like the serpent; and it is said to have the serpent's malignity also. These animals are found above three feet long, and thick in proportion, with a large head, and pointed snout. The whole body is covered with scales; and the belly is white, mixed with blue. It has four crooked teeth, and a pointed tail, which, however, can inflict no wound. It is viviparous: upon the whole, it appears to bear a strong affinity to the viper; and, like that animal, its bite may be dangerous.

CHAP. XXXIV.

Of Serpents—Of the venomous kind—The Viper—The Rattle-snake—The Whip-snake—The Asp—The Jaculus—The Hæmorrhois—The Seps—The Coral Snake—The Cobra-capella—Serpents without venom—The Ringed Snake—The Blind Worm—The Amphishæna—The Esculapian—The Boyuna—The Surinam Serpent—The Prince of Serpents—The Gerenda—The Jiboya—The Boiguacu—The Depona.

In none of the countries of Europe is the serpent tribe sufficiently numerous to be truly terrible. The venomous malignity also that has been ascribed to European serpents of old, is now utterly unknown; there are not above three or four kinds that are dangerous, and the poison of all operates in the same manner. A burning pain in the part, easily removeable by timely applications, is the worst effect that we experience from the bite of the most venomous serpents of Europe.

Though, however, Europe be happily delivered from these reptiles, in the warm countries that lie within the tropics, as well as in the cold regions of the north, where the inhabitants are few, the serpents propagate in equal proportion. All along the swampy banks of the river Niger or Oroonoko, where the sun is hot, the forests thick, and the men but few, the serpents cling among the branches of the trees in infinite numbers, and carry on an unceasing war against all other animals in their vicinity. Travellers have assured us, that they have often seen large snakes twining round the trunk of a tall tree, encompassing it like a wreath, and thus rising and descending at pleasure. In these countries, therefore, the serpent is too formidable to become an object of curiosity, for it excites much more violent sensations.

We are not, therefore, to reject, as wholly fabulous, the accounts left us by the ancients of the terrible devastations committed by a single serpent. It is probable, in early times, when the arts were little known, and mankind were but thinly scattered over the earth, that serpents, continuing undisturbed possessors of the forest, grew to an amazing magnitude; and every other tribe of animals fell before them. We have many histories of antiquity, presenting us such a picture; and exhibiting a whole nation sinking under the ravages of a single serpent. We are told, that

while Regulus led his army along the banks of the river Bagrada, in Africa, an enormous serpent disputed his passage over. We are assured by Pliny, who says that he himself saw the skin, that it was an hundred and twenty feet long, and that it had destroyed many of the army. At last, however, the battering engines were brought out against it; and these assailing it from a distance, it was soon destroyed.

With respect to their conformation, all serpents have a very wide mouth, in proportion to the size of the head; and, what is very extraordinary, they can gape and swallow the head of another animal which is three times as big as their own. To explain this, it must be observed, that the jaws of this animal do not open as ours, in the manner of a pair of hinges, where bones are applied to bones, and play upon one another; on the contrary, the serpent's jaws are held together at the roots by a stretching muscular skin; by which means they open as widely as the animal chooses to stretch them, and admit of a prey much thicker than the snake's own body. The throat, like stretching leather, dilates to admit the morsel; the stomach receives it in part; and the rest remains in the gullet, till putrefaction and the juices of the serpent's body unite to dissolve it.

As to the teeth, we shall speak more of them when we come to treat of the viper's poison. The tongue in all these animals is long and forky. It is composed of two long fleshy substances, which terminate in sharp points, and are very pliable. Some of the viper kind have tongues a fifth part of the length of their bodies; they are continually darting them out, but they are entirely harmless, and only terrify those who are ignorant of the real situation of their poison.

The skin is composed of a number of scales, united to each other by a transparent membrane, which grows harder as it grows older, until the animal changes it, which is generally done twice a year. This cover then bursts near the head, and the serpent creeps from it, by an undulatory motion, in a new skin, much more vivid than the former. As the edges of the foremost scales lie over the ends of their following scales, so those edges, when the scales are erected, which the animal has a power of doing in a small degree, catch in the ground, like the nails in the wheel of a chariot, and so promote and facilitate the animal's progressive motion. The erecting these scales is by means of a multitude of distinct muscles, with which each is supplied, and one end of which is tacked to the middle of the foregoing.

This tribe of animals, like that of fishes, seems to have no

bounds put to its growth: their bones are in a great measure cartilaginous, and they are consequently capable of great extension; the older, therefore, a serpent becomes, the larger it grows; and as they seem to live to a great age, they arrive at an enormous size.

Leguat assures us, that he saw a serpent in Java, that was fifty feet long; and Carli mentions their growing to above forty feet. Mr. Wentworth, who had large concerns in the Brebices, in America, assures us, that in that country they grow to an enormous length. He one day sent out a soldier, with an Indian, to kill a wild fowl for the table; and they accordingly went some miles from the fort: in pursuing their game, the Indian, who generally marched before, beginning to tire, went to rest himself upon the fallen trunk of a tree, as he supposed it to be; but when he was just going to sit down, the enormous monster began to move, and the poor savage perceiving that he had approached a jiboya, the greatest of all the serpent kind, dropped down in an agony. The soldier, who perceived at some distance what had happened, levelled at the serpent's head, and, by a lucky aim, shot it dead: however, he continued his fire, until he was assured that the animal was killed: and then, going up to rescue his companion, who was fallen motionless by its side, he, to his astonishment found him dead likewise, being killed by the fright. Upon his return to the fort, and telling what had happened, Mr. Wentworth ordered the animal to be brought up, when it was measured, and found to be thirty-six feet long.

In the East Indies they grow also to an enormous size; particularly in the island of Java, where, we are assured, that one of them will destroy and devour a buffalo. In a letter printed in the German Ephemerides, we have an account of a combat between an enormous serpent and a buffalo, by a person, who assures us, that he was himself a spectator. The serpent had, for some time, been waiting near the brink of a pool, in expectation of its prey; when a buffalo was the first that offered. Having darted upon the affrighted animal, it instantly began to wrap it round with its voluminous twistings: and at every twist the bones of the buffalo were heard to crack almost as loud as the report of a cannon. It was in vain that the poor animal struggled and bellowed; its enormous enemy entwined it too closely to get free; till at length, all its bones being mashed to pieces, like those of a malefactor on the wheel, and the whole body reduced to one uniform mass, the serpent untwined its folds to swallow its prey at leisure. To prepare for this, and in order to make

the body slip down the throat more readily, it was seen to lick the whole body over, and thus cover it with its mucus. It then began to swallow it at that end that offered least resistance; while its length of body was dilated to receive its prey, and thus took in at once a morsel that was three times its own thickness. We are assured by travellers, that these animals are often found with the body of a stag in their gullet, while the horns, which they are unable to swallow, keep sticking out at their mouths.

But it is happy for mankind, that the rapacity of these frightful creatures is often their punishment; for, whenever any of the serpent kind have gorged themselves in this manner, whenever their body is seen particularly distended with food, they then become torpid, and may be approached and destroyed with safety.

Other creatures have a choice in their provision; but the serpent indiscriminately preys upon all; the buffalo, the tiger, and the gazelle. One would think that the porcupine's quills might be sufficient to protect it; but whatever has life serves to appease the hunger of these devouring creatures: porcupines, with all their quills, have frequently been found in their stomachs, when killed and opened; nay, they most frequently are seen to devour each other.

But though these animals are, above all others, the most voracious; and though the morsel which they swallow without chewing, is greater than what any other creature, either by land or water, the whale itself not excepted, can devour, yet no animals upon earth bear abstinence so long as they. A single meal, with many of the snake kind, seems to be the adventure of a season; and is an occurrence for which they have been for weeks, nay, sometimes for months, in patient expectation. Their prey continues, for a long time, partly in the stomach, partly in the gullet: and a part is often seen hanging out of the mouth. In this manner it digests by degrees; and in proportion as the part below is dissolved, the part above is taken in. It is not therefore till this tedious operation is entirely performed, that the serpent renews its appetite and its activity. But should any accident prevent it from issuing once more from its cell, it still can continue to bear famine for weeks, months, nay, for years together. Vipers are often kept in boxes for six or eight months, without any food whatever: and there are little serpents sometimes sent over to Europe, from Grand Cairo, that live for several years in glasses, and never eat at all, nor even stain the glass with their excrement. Thus the serpent tribe unite

in themselves two very opposite qualities; wonderful abstinence, and yet incredible rapacity.

Though all serpents are amphibious, some are much fonder of the water than others; and, though destitute of fins or gills, remain at the bottom, or swim along the surface with great ease. They can, however, endure to live in fresh water only; for salt is an effectual bane to the whole tribe.

Some serpents have a most horrible fœtor attending them, which is alone capable of intimidating the brave. This proceeds from two glands near the vent, like those in the weasel or the pole-cat; and, like those animals, in proportion as they are excited by rage or by fear, the scent grows stronger. It would seem, however, that such serpents as are most venomous, are least offensive in this particular; since the rattle-snake and the viper have no smell whatever: nay, we are told that at Calcutta and Cranganore, in the East Indies, there are some very noxious serpents, who are so far from being disagreeable, that their excrements are sought after, and kept as the most pleasing perfume. The Esculapian serpent is also of this number.

Some serpents bring forth their young alive; as the viper: some bring forth eggs, which are hatched by the heat of their situation; as the common black snake, and the majority of the serpent tribe. When a reader, ignorant of anatomy, is told, that some of these animals produce their young alive, and that some produce eggs only, he is apt to suppose a very great difference in their internal conformation, which makes such a variety in their manner of bringing forth. But this is not the case: these animals are internally alike, in whatever manner they produce their young; and the variety in their bringing forth is rather a slight than a real discrimination. The only difference is, that the viper hatches her eggs, and brings them to maturity within her body; the snake is more premature in her productions, and sends her eggs into the light some time before the young ones are capable of leaving the shell. Thus, if either are opened, the eggs will be found in the womb, covered with their membraneous shell, and adhering to each other, like large beads on a string. In the eggs of both the young ones will be found, though at different stages of maturity: those of the viper will crawl and bite, the moment the shell that encloses them is broken open; those of the snake are not yet arrived at their perfect form.

Father Labat took a serpent of the viper kind, that was nine feet long, and ordered it to be opened in his presence.

He then saw the manner in which the eggs of these animals lie in the womb. In this creature there were six eggs, each of the size of a goose egg, but longer, more pointed, and covered with a membraneous skin, by which also they were united to each other. Each of these eggs contained from thirteen to fifteen young ones, about six inches long, and as thick as a goose quill. The little mischievous animals were no sooner let loose from the shell, than they crept about, and put themselves into a threatening posture, coiling themselves up, and biting the stick with which he was destroying them. In this manner he killed seventy-four young ones; those that were contained in one of the eggs escaped at the place where the female was killed, by the bursting of the egg, and there getting among the bushes.

The last distinction that we shall mention, but the most material among serpents, is, that some are venomous and some inoffensive; but not above a tenth of their number are actually venomous.

From the noxious qualities in the serpent kind, it is no wonder that not only man, but beasts and birds, carry on an unceasing war against them. The ichneumon of the Indians, and the peccary of America, destroy them in great numbers. These animals have the art of seizing them near the head; and it is said they can skin them with great dexterity. The vulture and the eagle also prey upon them in great abundance; and often sousing down from the clouds, drop upon a long serpent, which they snatch struggling and writhing in the air. Dogs also are bred up to oppose them.

Father Feuillée tells us, that being in the woods of Martinico, he was attacked by a large serpent, which he could not easily avoid, when his dog immediately came to his relief, and seized the assailant with great courage. The serpent entwined him, and pressed him so violently, that the blood came out of his mouth, and yet the dog never ceased till he had torn it to pieces. The dog was not sensible of his wounds during the fight; but soon after, his head swelled prodigiously, and he lay on the ground as dead. But his master having found, hard by, a banana-tree, he applied its juice, mixed with treacle, to the wound; which recovered the dog, and quickly healed his sores.

In India there is nothing so common as dancing serpents, which are carried about in a broad flat vessel somewhat resembling a sieve. These erect and and put themselves in motion at the word of command. When their keeper sings a slow tune, they seem by their heads to keep time; when he

sings a quicker measure, they appear to move more brisk and lively. All animals have a certain degree of docility; and we find that serpents themselves can be brought to move and approach at the voice of their master. From this trick successfully practised before the ignorant, it is most probable, has arisen all the boasted pretensions which some have made to charming of serpents; an art to which the native Americans pretend at this very day.

Of venomous Serpents. In all countries, the poison of the serpent is sufficiently formidable to deserve notice, and to excite our attention to its nature and effects. It will therefore, in the first place, be proper to describe its seat in the animal, as also the instrument by which the wound is made, and the poison injected. In all this venomous class of reptiles, whether the viper, the rattle-snake, or the cobra di capello, there are two large teeth or fangs that issue from the upper jaw, and that hang out beyond the lower. The rest of the snake tribe are destitute of these; and it is most probable, that wherever these fangs are wanting, the animal is harmless; on the contrary, wherever they are found, it is to be avoided as the most pestilent enemy. Our first great attention, therefore, upon seeing a serpent, should be directed to the teeth. The black snake, the Liboya, the blind worm, and a hundred others that might be mentioned, have their teeth of an equal size, fixed into the jaws, and with no other apparatus for inflicting a dangerous wound than a dog or a lizard; but it is otherwise with the venomous tribe we are now describing; these are well furnished, not only with a laboratory, where the poison is formed, but a canal, by which it is conducted to the jaw, a bag under the tooth for keeping it ready for every occasion, and also an aperture in the tooth itself for injecting it into the wound. The venom contained in this bag is a yellowish, thick, tasteless liquor, which injected into the blood is death, yet which may be swallowed without any danger.

The fangs that give the wound are large in proportion to the size of the animal that bears them; crooked, yet sharp enough to inflict a ready wound. They grow one on each side, and sometimes two, from two moveable bones in the upper jaw, which, by sliding backward or forward, have a power of erecting or depressing the teeth at pleasure. In these bones are also fixed many teeth, but no way venomous, and only serving to take and hold the animal's prey. If a viper inflicts the wound, and the remedy be neglected, the symptoms are not without danger. It first causes an acute pain

in the place affected, attended with a swelling, first red, and afterwards livid. To this succeed great sickness in the stomach, bilious and convulsive vomitings, cold sweats, pains about the navel, and death itself. These symptoms are much more violent, and succeed each other more rapidly, after the bite of a rattle-snake; but when the person is bit by the cobra di capello, he dies in an hour, his whole frame being dissolved into a putrid mass of corruption.

In the Eastern and Western Indies, the number of noxious serpents is various; in England the inhabitants are acquainted only with one. The viper is the only animal of Great Britain whose bite is dangerous. In the tropical climates, the rattle-snake, the whip-snake, and the cobra di capello, are the most formidable, though by no means the most common.

VIPERS are found in many parts of Europe; but the dry, stony, and in particular the chalky countries abound with them. This animal seldom grows to a greater length than two feet; though sometimes they are found above three. The ground colour of their bodies is a dirty yellow; that of the female is deeper. The back is marked the whole length with a series of rhomboid black spots touching each other at the points; the sides with triangular ones, the belly entirely black. It is chiefly distinguished from the common ringed snake by the colour, which in the latter is more beautifully mottled, as well as by the head, which is thicker than the body; but particularly by the tail, which, in the viper, though it ends in a point, does not run tapering to so great a length as in the other. When, therefore, other distinctions fail, the difference of the tail can be discerned at a single glance.

The viper differs from most other serpents in being much slower, as also in excluding its young completely formed, and bringing them forth alive. The kindness of Providence seems exerted not only in diminishing the speed, but also the fertility, of this dangerous creature. They copulate in May, and are supposed to be about three months before they bring forth, and have seldom above eleven eggs at a time. These are of the size of a blackbird's egg, and chained together in the womb like a string of beads. Each egg contains from one to four young ones; so that the whole of a brood may amount to about twenty or thirty. They continue in the womb till they come to such perfection as to be able to burst from the shell; and they are said by their own efforts to creep from their confinement into the open air, where

they continue for several days without taking any food whatsoever.

The viper is capable of supporting very long abstinence, it being known that some have been kept in a box six months without food; yet during the whole time they did not abate of their vivacity. They feed only a small part of the year, but never during their confinement; for if mice, their favourite diet, should at that time be thrown into their box, though they will kill, yet they will never eat them. When at liberty, they remain torpid throughout the winter; yet, when confined, have never been observed to take their annual repose.

They are usually taken with wooden tongs, by the end of the tail, which may be done without danger; for, while held in that position, they are unable to wind themselves up to hurt their enemy; yet, notwithstanding this precaution, the viper-catchers are frequently bitten by them; but, by the application of olive-oil the bite is effectually cured.

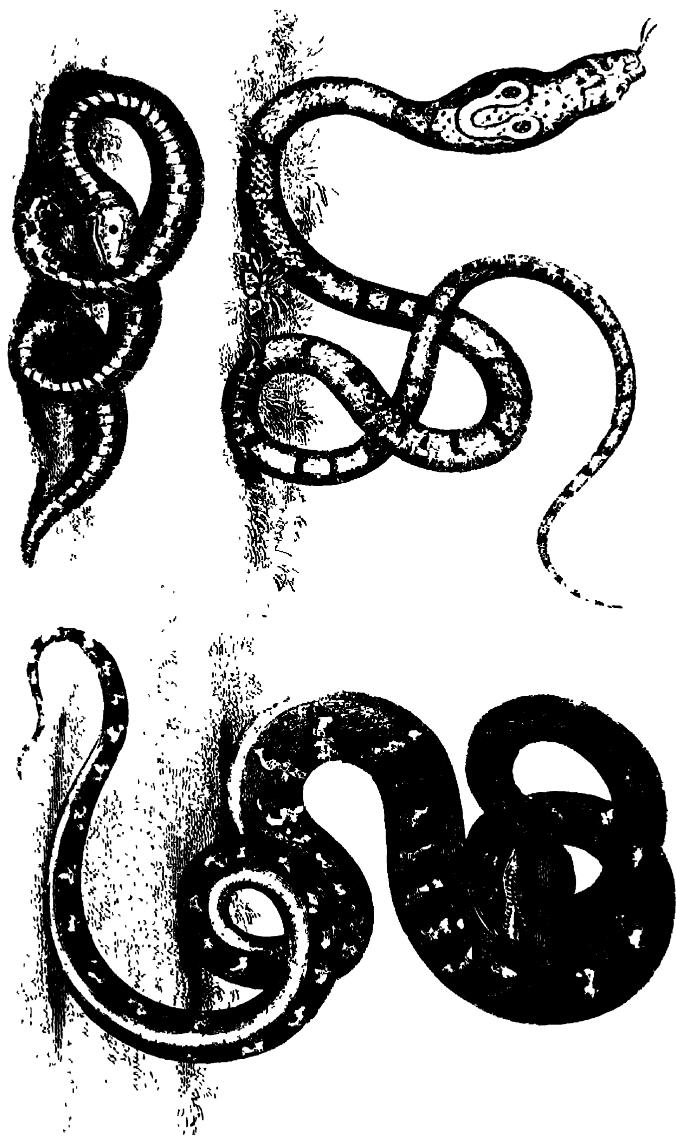
The Rattle-snake is bred in America, and in no part of the old world. Some are as thick as a man's leg, and six feet in length; but the most usual size is from four to five feet long. In most particulars it resembles the viper: it differs, however, in having a large scale, which hangs like a penthouse over each eye. They are of an orange tawny, and blackish colour on the back; and of an ash-colour on the belly, inclining to lead. The male may be readily distinguished from the female, by a black velvet spot on the head, and by the head being smaller and longer. But that which, besides their superior malignity, distinguishes them from all other animals, is their rattle, an instrument lodged in their tail, by which they make such a loud, rattling noise, when they move, that their approach may readily be perceived, and the danger avoided. This rattle, which is placed in the tail, somewhat resembles, when taken from the body, the curb chain of a bridle: it is composed of several thin, hard, hollow bones, linked on each other, and rattling upon the slightest motion It is supposed by some, that the snake acquires an additional bone every year; and that from this its age may be precisely known: however this may be, certain it is, that the young snakes of a year or two old have no rattles at all; while many old ones have been killed, that had from eleven to thirteen joints each. They shake and make a noise with these rattles with prodigious quickness when they are disturbed; however, the peccary and the vulture are no way terrified at the sound, but hasten at the signal to seize the snake, as their most favourite prey.

It is very different with almost every other animal. The certain death which ensues from this terrible creature's bite, makes a solitude wherever it is heard. It moves along with the most majestic rapidity: neither seeking to offend the larger animals, nor fearing their insults. If unprovoked, it never meddles with any thing but its natural prey; but when accidentally trod upon, or pursued to be destroyed, it then makes a dreadful and desperate defence. It erects itself upon its tail, throws back its head, and inflicts the wound in a moment; then parts, and inflicts a second wound: after which, we are told by some, that it remains torpid and inactive, without even attempting to escape.

The very instant the wound is inflicted, though small in itself, it appears more painful than the sting of a bee. This pain, which is so suddenly felt, far from abating, grows every moment more excruciating and dangerous: the limb swells; the venom reaches the head, which is soon of a monstrous size; the eyes are red and fiery; the heart beats quick, with frequent interruptions: the pain becomes insupportable, and some expire under it in five or six hours; but others, who are of stronger constitutions, survive the agony for a few hours longer, only to sink under a general mortification which ensues, and corrupts the whole body.

A serpent, called the WHIP-SNAKE, is still more venomous than the former. This animal, which is a native of the East, is about five feet long, yet not much thicker than the thong of a coachman's whip. It is exceedingly venomous; and its bite is said to kill in about six hours. One of the Jesuit missionaries, happening to enter into an Indian pagoda, saw what he took to be a whip-cord lying on the floor, and stooped to take it up; but upon handling it, what was his surprise to find that it was animated, and no other than the whip-snake, of which he had heard such formidable accounts. Fortune, however, seemed favourable to him; for he grasped it by the head, so that it had no power to bite him, and only twisted its folds up his arm. In this manner he held it, till it was killed by those who came to his assistance.

To this formidable class might be added the ASP, whose bite, however, is not attended with those drowsy symptoms which the ancients ascribed to it. The JACULUS of Jamaica, also, is one of the swiftest of the serpent kind. The HÆMORRHOIS, so called from the hæmorrhages which its bite is said to produce; the SEPS, whose wound is very venomous, and causes the part affected to corrupt in a very short time; the



CORAL SERPENT, which is red, and whose bite is said to be fatal. But the COBRA DI CAPELLO, or HOODED SERPENT, inflicts the most deadly and incurable wounds. Of this formidable creature there are five or six different kinds; but they are all equally dangerous, and their bite is followed by speedy and certain death. It is from three to eight feet long, with two large fangs hanging out of the upper jaw. It has a broad neck, and a mark of dark brown on the forehead; which, when viewed frontwise, looks like a pair of spectacles; but behind, like the head of a cat. The eyes are fierce, and full of fire; the head is small, and the nose flat, though covered with very large scales, of a yellowish ash-colour; the skin is white; and the large tumour on the neck is flat, and covered with oblong, smooth scales.

OF SERPENTS WITHOUT VENOM. This class of serpents all want that natural mechanism by which the poisonous tribe inflict such deadly wounds: they have no glands in the head for preparing venom; no conduits for conveying it to the teeth; no receptacles there; no hollow in the instrument that inflicts the wound. Their bite, when the teeth happen to be large enough to penetrate the skin, for in general they are too small for this purpose, is attended with no other symptoms than those of an ordinary puncture; and many of this tribe, as if sensible of their own impotence, cannot be provoked to bite, though ever so rudely assaulted. They hiss, dart out their forky tongues, erect themselves on the tail, and call up all their terrors to intimidate their aggressors, but seem to consider their teeth as unnecessary instruments of defence, and never attempt to use them. Even among the largest of this kind, the teeth are never employed in the most desperate engagements. When a hare or a bird is caught, the teeth may serve to prevent such small game from escaping; but, when a buffalo or a tiger is to be encountered, it is by the strong folds of the body, by the fierce verberations of the tail, that the enemy is destroyed: by thus twining round, and drawing the knot with convulsive energy, this enormous reptile breaks every bone in the quadruped's body, and then at one morsel devours its prey.

Hence we may distinguish the unvenomous tribe into two kinds: first, into those which are seldom found of any considerable magnitude, and that never offend animals larger and more powerful than themselves, but which find their chief protection in flight, or in the doubtfulness of their form; secondly, into such as grow to an enormous size, fear no enemy, but indiscriminately attack all other animals, and devour

them. Of the first kind is the common ringed snake, the blind worm, the Esculapian serpent, the Amphisbæna, and several others. Of the second, the Jiboya, the Boiguacu, the Depona, and the Boiquatrara.

The Ringed Snake, is the largest of English serpents, sometimes exceeding four feet in length. The neck is slender, the middle of the body thick, the back and sides covered with small scales; the belly with oblong, narrow, transverse plates; the colour of the back and sides is of a dusky brown; the middle of the back marked with two rows of small black spots, running from the head to the tail; the plates on the belly are dusky; the scales on the sides are of a blueish white; the teeth are small and serrated, lying on each side of the jaw, in two rows. The whole species is perfectly inoffensive, taking shelter in dunghills, and among bushes in moist places: whence they seldom remove, unless in the midst of the day, in summer, when they are invited out by the heat, to bask themselves in the sun.

This snake preys upon frogs, insects, worms, mice, and young birds; and, considering the smallness of the neck, it is amazing how large an animal it will swallow.

The *black snake* of Virginia, which is larger than the above, and generally grows to six feet long, takes a prey proportionable to its size; partridges, chickens, and young ducks. It is generally found in the neighbourhood of the hen-roost, and will devour the eggs, even while the hen is sitting upon them; these it swallows whole; and often, after it has done the mischief, will coil itself round in the nest.

The whole of this tribe are oviparous, laying eighty or an hundred eggs at a time, in dung-hills or hot-beds; the heat of which, aided by that of the sun, brings them to maturity. During winter they lie torpid, in banks, or hedges, and under old trees.

The Blind Worm is another harmless reptile, with a formidable appearance. The usual length of this species is eleven inches. The eyes are red, the head small, the neck still more slender; from that part the body grows suddenly, and continues of an equal bulk to the tail, which ends quite blunt. The colour of the back is cinereous, marked with very small lines composed of minute black specks. The motion of this serpent is slow; from which, and from the smallness of the eyes, are derived its name; some calling it the slow, and some the blind worm. Like

all the rest of the kind, in our climates, they lie torpid during the winter, and are sometimes found, in vast numbers, twisted together. This animal, like the former, is perfectly innocent; like the viper, however, it brings forth its young alive.

The AMPHISBÆNA, or the double-headed serpent, is remarkable for moving along with either the head or the tail foremost; whence it has been thought to have two heads. Some have affirmed that its bite is dangerous; but this must be a mistake, as it wants the fangs, and consequently the laboratory that prepares the poison.

The ESCULAPIAN SERPENT of Italy is among this number. It is there suffered to crawl about the chambers, and often gets into the beds where people lie. It is a yellow serpent, of about an ell long; and, though innocent, yet will bite when exasperated. They are said to be great destroyers of mice; and this may be the reason why they are taken under human protection. The BOYUNA of Ceylon, is equally a favourite among the natives; and they consider the meeting it as a sign of good luck. The SURINAM SERPENT, which some improperly call the Ammodytes, is equally harmless and desirable among the savages of that part of the world. They consider themselves as extremely happy if this animal comes into their huts. The colours of this serpent are so many and beautiful, that they surpass all description; and these, perhaps, are the chief inducements to the savage, to consider its visits so very fortunate. A still greater favourite is the PRINCE of SERPENTS, a native of Japan, that has not its equal for beauty. The scales which cover the back are reddish, finely shaded, and marbled with large spots of irregular figures mixed with black. The fore part of the head is covered with yellow; the forehead marked with a black marbled streak, and the eyes handsome and lively. But the GERENDA of the East Indies is the most honoured and esteemed. To this animal, which is finely spotted with various colours, the natives of Calicut pay divine honours; and, while their deity lies coiled up, which is its usual posture, the people fall upon their faces before it, with stupid adoration. The African Gerenda is larger, and worshipped in the same manner by the inhabitants of the coasts of Mozambique.

But in the larger tribe of serpents there is nothing but

danger to be apprehended. This formidable class, though without venom, have something frightful in their colour, as well as their size and form. They want that vivid hue, with which the savages are so much pleased in the lesser kinds. They are all found of a dusky colour, with large teeth, which are more formidable than dangerous.

The first of this class is the great JIBOYA of Java and Brazil, which Leguat affirms he has seen fifty feet long. The largest animal of this kind, which has been brought into Europe, is but thirty-six feet long; and it is probable, that much greater have been seen and destroyed, before they were thought worth sending so far, to satisfy European curiosity. The most usual length, however, of the jiboya, is about twenty feet, and the thickness in proportion. The teeth are small in proportion to the body; nor are they used, but when it seizes the smallest prey.

The BOIGUACU is supposed to be the next in magnitude, and has often been seen to swallow a goat whole. It is thickest in the middle of the body, and grows smaller towards the head and the tail. It has a double row of sharp teeth in each jaw, shining like mother-of-pearl. The head is broad, and over the eyes it is raised into two prominences: near the extremity of the tail there are two claws resembling those of birds.

These serpents lie hid in thickets, whence they sally out unawares, and raising themselves upright on their tails, will attack both men and beasts. They make a loud hissing noise when exasperated; and sometimes, winding up trees, will dart down upon travellers, and twist themselves so closely round their bodies, as to dispatch them in a very few minutes.

To this class of large serpents, we may refer the DEPONA, a native of Mexico, with a very large head, and great jaws. The mouth is armed with cutting, crooked teeth, among which there are two longer than the rest, placed in the fore part of the upper jaw, but very different from the fangs of the viper. All round the mouth there is a broad, scaly border; and the eyes are so large, that they give it a very terrible aspect. The forehead is covered with very large scales, on which are placed others, that are smaller, curiously ranged: those on the back are greyish. Each side of the belly is marbled with large square spots, of a chesnut colour; in the middle of which is a spot, which is round and yellow. They avoid the sight of man; and, consequently, never do much harm.

CHAP. XXXV.

Of insects in general—Insects without Wings—The SPIDER—*House, Garden, Wandering, Field, and Martinico Spiders—The Water Spider—The Tarantula—The* FLEA—*Tee* LOUSE—*The Leaf Louse—The* BUG—*The* WOOD LOUSE—*The* WATER FLEA—*The* SCORPION—*The* CENTIPES—*The Gallyworm—The* LEECH.

OF all animated beings, man offers the most wonderful variety in his internal conformation; quadrupeds come next; and other animals follow in proportion to their powers or their excellencies. Insects seem, above all others, the most imperfectly formed; from their minuteness, the dissecting knife can go but a short way in the investigation; but one thing argues an evident imperfection: which is, that many of them can live a long time, though deprived of those organs which are necessary to life in the higher ranks of nature. Many of them are furnished with lungs and a heart like nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away.

If insects be considered as bearing a relation to man, and as assisting him in the pleasures or necessities of life, they will, even in this respect, sink in the comparison with the larger tribes of nature. It is true, that the bee, the silkworm, the cochineal fly, and the catharides, render him signal services; but how many others of this class are either noxious, or totally unserviceable to him. Even in these countries, where all the noxious animals have been reduced by repeated assiduity, the insect tribes still maintain their ground, and are but too often unwelcome intruders upon the fruits of human industry. But, in more uncultivated regions, their annoyance and devastations are terrible. What an uncomfortable life must the natives lead in Lapland, and some parts of America, where, if a candle be lighted, the insects swarm in such abundance, as instantly to extinguish it with their numbers; where the inhabitants are obliged to smear their bodies and faces with tar, or some other composition, to protect them from the puncture of their minute enemies; where, though millions are destroyed, famished millions are still seen to succeed, and to make the torture endless!

Yet, while we are thus fixing the rank of a certain class of animals, it seems necessary to define the nature of those animals which are thus degraded. Definitions, in general, produce little knowledge; but here, where the shades of nature are so intimately blended, some discrimination is necessary to prevent confusion. The smallness of the animal, for instance, does not constitute an insect: for then, many of the lizard kind, which are not above two inches long, would come under this denomination; and if the smaller lizards, why not the crocodile, which would be a terrible insect indeed? In the same manner, smallness, with a slow, creeping motion, does not constitute an insect; for, though snails might be called insects with some propriety, the whole tribe of sea shell-fish would then have equal pretensions, and a very troublesome innovation would be brought into our language, which is already formed. Excluding such animals, therefore, from the insect tribe, we may define insects to be *little animals without red blood, bones or cartilages, furnished with a trunk, or else a mouth, opening lengthwise, with eyes which they are incapable of covering, and with lungs which have their openings on the sides.* This definition comprehends the whole class of insects, whether with or without wings, whether in their caterpillar or butterfly state, whether produced in the ordinary method of generation between male and female, or from an animal that is itself both male and female, or from the same animal cut into several parts, and each part producing a perfect animal.

In a cursory inspection of the insect tribe, the first animals that offer themselves are those which want wings, that appear crawling about on every plant, and on every spot of earth which we regard with any degree of attention. Those therefore that never have wings, but creep about till they die, may be considered as constituting the first class of insects. All these, the flea and the wood-louse only excepted, are produced from an egg; and, when once they break the shell, they never suffer any further change of form, but continue to grow larger till they die. The second order of insects consists of such as have wings: but which, when produced from the egg, have those wings cased up in such a manner as not to appear. The third order of insects is of the moth and butterfly kind. The fourth order is of those winged insects which come from a worm, instead of a caterpillar, and yet go through changes similar to those which moths and butterflies are seen to undergo. To these we add, as a fifth order, a numerous tribe lately discovered,

to which naturalists have given the name of Zoophytes. These do not go through the ordinary forms of generation, but may be propagated by dissection. They seem a set of creatures placed between animals and vegetables, and make the shade that connects animated and insensible nature.

Of Insects without Wings.

If we consider this class as distinct from others, we shall find them in general longer lived than the rest, and often continuing their term beyond one season, which is the ordinary period of an insect's existence. They seem also less subject to the influence of the weather; and often endure the rigours of winter without being numbed into torpidity. The whole race of moths, butterflies, bees, and flies, are rendered lifeless by the return of cold weather; but we need not be told, that the louse, the flea, and many of these wingless creatures that seem formed to tease mankind, continue their painful depredations the whole year round.

They come to perfection in the egg, and it sometimes happens, that when the animal is interrupted in performing the offices of exclusion, the young ones burst the shell within the parent's body, and are thus brought forth alive. This not unfrequently happens with the wood-louse, and others of the kind, which are sometimes seen producing eggs, and sometimes young ones perfectly formed.

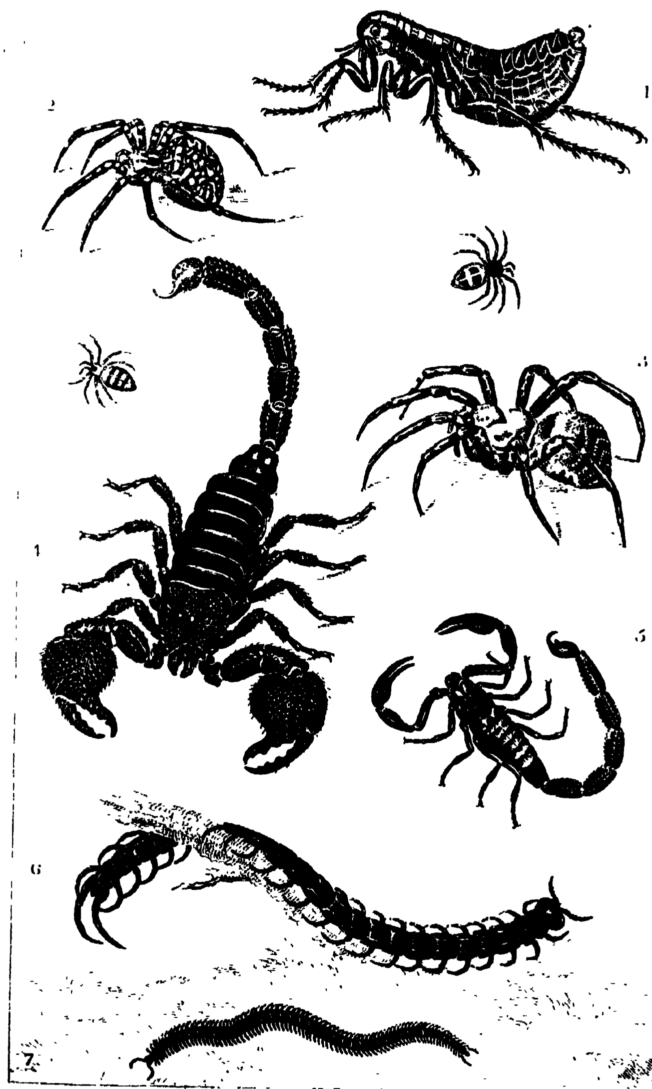
Though these creatures are perfect from the beginning, yet they are often, during their existence, seen to change their skin: this is a faculty which they possess in common with many of the higher ranks of animals, and which answers the same purposes. However tender their skins may seem to our feel, yet, if compared to the animal's strength and size, they will be found to resemble a coat of mail, or, to talk more closely, the shell of a lobster. By this skin these animals are defended from accidental injuries, and particularly from the attacks of each other; within this they continue to grow, till their bodies become so large as to be imprisoned in their own covering, and then the shell bursts, but is quickly replaced by a new one.

Lastly, these animals are endued with a degree of strength for their size, that at first might exceed credibility.—Had man an equal degree of strength, bulk for bulk, with a louse or flea, the history of Sampson would be no longer miraculous.—A flea will draw a chain an hundred times heavier than itself; and to compensate for this force, will eat ten imes its own size of provision in a single day.

THE SPIDER. The animal that deserves our first notice in this principal order of insects is the spider, whose manners are the most subtle, and whose instincts are most various. Formed for a life of rapacity, and incapable of living upon any other than insect food, all its habits are calculated to deceive and surprise; it spreads sails to entangle its prey; it is endued with patience to expect its coming; and is possessed of arms and strength to destroy it when fallen into the snare.

In these countries, where all the insect tribes are kept under by human assiduity, the spiders are but small and harmless. We are acquainted with few but the *house-spider*, which weaves its web in neglected rooms; the *garden-spider*, which spreads its sails from tree to tree, and rests in the centre; the *wandering-spider*, that has no abode like the rest: and the *field-spider*, which is sometimes seen mounting, web and all, into the clouds. These are the chief of our native spiders; which, though reputed venomous, are entirely inoffensive. But they form a much more terrible tribe in Africa and America. In fact, the bottom of the *Martinico spider's* body is as large as a hen's egg, and covered all over with hair. Its web is strong, and its bite dangerous.

Every spider has two divisions in its body. The fore part, containing the head and breast, is separated from the hinder part or belly by a very slender thread, through which, however, there is a communication from one part to the other. The fore part is covered with a hard shell, as well as the legs, which adhere to the breast. The hinder part is clothed with a supple skin, beset all over with hair. They have several eyes all round the head, brilliant and acute; these are sometimes eight in number, sometimes but six; two behind, two before, and the rest on each side. Like all other insects, their eyes are immoveable, and they want eye-lids; but this organ is fortified with a transparent, horny substance, which at once secures and assists their vision. As the animal procures its subsistence by the most watchful attention, so large a number of eyes is necessary to give it the earliest information of the capture of its prey. They have two pincers on the fore part of the head, rough, with strong points, toothed like a saw, and terminating in claws like those of a cat. A little below the point of the claw there is a small hole, through which the animal emits a poison, which, though harmless to us, is sufficiently capable of instantly destroying its prey. This is the most powerful weapon they have against their enemies; they can open or extend these pincers as occasion may require: and when they are undisturbed, they suffer them to lie one upon the other, never opening them but when there



1. Flea. _2. Garden Spider _3. Tarantula Spider.
4 & 5. Scorpions _6 Centipede _7. Millipede.

is a necessity for their exertion. They have all eight legs, joined like those of lobsters, and similar also in another respect; for if a leg be torn away, or a joint cut off, a new one will quickly grow in its place, and the animal will find itself fitted for combat as before. At the end of each leg there are three crooked moveable claws; namely, a small one, placed higher up, like a cock's spur, by the assistance of which it adheres to the threads of its web. There are two others larger, which meet together like a lobster's claw, by which they can catch hold of the smallest depressions, walking up or down the very polished surfaces, on which they can find inequalities that are imperceptible to our grosser sight. But when they walk upon such bodies as are perfectly smooth, as looking-glass, or polished marble, they squeeze a little sponge, which grows near the extremity of their claws, and thus diffusing a glutinous substance, adhere to the surface until they make a second step. Besides the eight legs just mentioned, animals have two others, which may more properly be called arms, as they do not serve to assist motion, but are used in holding and managing their prey.

The spider, though thus formidably equipped, would seldom prove successful in the capture, were it not equally furnished with other instruments to assist its depredations. It is a most experienced hunter, and spreads its nets to catch such animals as it is unable to pursue. The spider's web is generally laid in those places where flies are most apt to shelter. There the little animal remains for days, nay weeks together, in patient expectation, seldom changing its situation though ever so unsuccessful.

For the purposes of making this web, Nature has supplied this animal with a large quantity of glutinous matter, and five dugs or teats for spinning it into thread. This substance is contained in a little bag, and at first sight it resembles soft glue; but when examined more accurately, it will be found twisted into many coils of an agate colour, and upon breaking it, the contents may be easily drawn out into threads, from the tenacity of the substance, not from those threads being already formed. Those who have seen the machine by which wire is spun, will have an idea of the manner in which this animal forms the threads of its little net, the orifices of the five teats above mentioned, through which the thread is drawn, contracting or dilating at pleasure. The threads which we see, and appear so fine, are, notwithstanding composed of five joined together, and these are many times doubled when the web is in formation.

When a *house-spider* proposes to begin a web, it first makes

choice of some commodious spot, where there is an appearance of plunder and security. The animal then distils one little drop of its glutinous liquor which is very tenacious, and then creeping up the wall, and joining its thread as it proceeds, it darts itself in a very surprising manner to the opposite place, where the other end of the web is to be fastened. The first thread thus formed, drawn tight, and fixed at each end, the spider then runs upon it backward and forward, still assiduously employed in doubling and strengthening it, as upon its force depends the strength and stability of the whole. The scaffolding thus completed, the spider makes a number of threads parallel to the first, in the same manner, and then crosses them with others; the clammy substance of which they are formed serving to bind them, when newly made, to each other.

The insect, after this operation, doubles and trebles the thread that borders its web, by opening all its teats at once, and secures the edges, so as to prevent the wind from blowing the work away. The edges being thus fortified, the retreat is next to be attended to; and this is formed like a funnel at the bottom of the web, where the little creature lies concealed. To this are two passages, or outlets, one above and the other below, very artfully contrived, to give it an opportunity of making excursions at proper seasons, of prying into every corner, and cleaning those parts which are observed to be clogged or encumbered. Still attentive to its web, the spider, from time to time, cleans away the dust that gathers round it, which might otherwise clog and incommode it: for this purpose, it gives the whole a shake with its paws; still, however, proportioning the blow so as not to endanger the fabric. It often happens also, that from the main web there are several threads extended at some distance on every side: these are, in some measure, the outworks of the fortification, which, whenever touched from without, the spider prepares for attack or self-defence. If the insect impinging be a fly, it springs forward with great agility; if, on the contrary, it be the assault of an enemy stronger than itself, it keeps within its fortress, and never ventures out till the danger be over. Another advantage which the spider reaps from the contrivance of a cell, or retreat behind the web, is, that it serves for a place where the creature can feast upon its game with all safety, and conceal the fragments of those carcases which it has picked, without exposing to public view the least trace of barbarity, that might create a suspicion in any insects that their enemy was near.

It often happens, however, that the wind, or the shaking

of the supporters, or the approach of some large animal, destroys in a minute the labours of an age. In this case the spider is obliged to remain a patient spectator of the universal ruin; and when the danger is passed away, it sets about repairing the calamity. In general, the animal is much fonder of mending than making, as it is furnished originally with but a certain quantity of glutinous matter, which, when exhausted, nothing can renew. The time seldom fails to come, when their reservoirs are entirely dried up, and the poor animal is left to all the chances of irretrievable necessity. An old spider is thus frequently reduced to the greatest extremity; its web is destroyed, and it wants the materials to make a new one. But as it has been long accustomed to a life of shifting, it hunts about to find out the web of another spider, younger and weaker than itself, with whom it ventures a battle. The invader generally succeeds; the young one is driven out to make a new web, and the old one remains in quiet possession. If, however, the spider is unable to dispossess any other of its web, it then endeavours, for a while, to subsist upon accidental depredation; but in two or three months it inevitably dies of hunger.

The *garden-spider* seems to work in a different manner. The method with this insect is to spin a great quantity of thread, which floating in the air in various directions, happens, from its glutinous quality, at last to stick to some object near it, a lofty plant or the branch of a tree. The spider only wants to have one end of the line fast in order to secure and tighten the other. It accordingly draws the line when thus fixed, and then by passing and repassing upon it, strengthens the thread in such a manner as to answer all its intentions. The first cord being thus stretched, the spider walks along a part of it, and there fastens another, and dropping thence, fastens the thread to some solid body below, then climbs up again and begins a third, which it fastens by the same contrivance. When three threads are thus fixed, it forms a square, or something that very nearly resembles one; and in this the animal is generally seen to reside. It often happens, however, when the young spider begins spinning, that its web becomes too buoyant, and not only the thread floats in the air, but even the little spinster. In this manner we have often seen the threads of spiders floating in the air; and, what is still more surprising, the young spiders themselves attached to their own web.

The spider's web being completed, and fixed in a proper place, its next care is to seize and secure whatever insect happens to be caught in the toil. For this purpose, it

remains for weeks and even months upon the watch, without ever catching a single fly; for the spider, like most other insects, is surprisingly patient of hunger. It sometimes happens that too strong a fly strikes itself against the web, and thus, instead of being caught, tears the net to pieces. In general, however, the butterfly or the hornet, when they touch the web, fly off again, and the spider seems no way disposed to interrupt their retreat. The large blue-bottle-fly, the ichneumon-fly, and the common meat-fly, seem to be its favourite game. When one of these strike into the toils, the spider is instantly seen alert and watchful at the mouth of its hole, careful to observe whether the fly be completely secured. If that be the case, the spider walks leisurely forward, seizes its prey, and instantly kills it by instilling a venomous juice into the wound it makes. If, however, the fly be not fast, the spider patiently waits, without appearing, until its prey has fatigued itself by its struggles to obtain its liberty; for if the ravager should appear in all his terrors, while the prey is but half involved, a desperate effort might give it force enough to get free. If the spider has fasted for a long time, it then drags the fly immediately into its hole and devours it; but if there has been plenty of game, and the animal be no way pressed by hunger, it then gives the fly two or three turns in its web, so as completely to secure it, and there leaves it impotently to struggle until the little tyrant comes to its appetite.

It has been the opinion of some philosophers, that the spider was in itself both male and female; but Lister has been able to distinguish the sexes, and to perceive that the males were much less than the females.

The female generally lays from nine hundred to a thousand eggs in a season. These eggs are large or small in proportion to the size of the animal that produces them. In some they are as large as a grain of mustard-seed; in others, they are scarcely visible. The female never begins to lay till she is two years old.

When the number of eggs which the spider has brought forth have remained for an hour or two to dry after exclusion, the little animal then prepares to make them a bag, where they are to be hatched, until they leave the shell. For this purpose, she spins a web four or five times stronger than that made for catching flies; and, besides, lines it on the inside with down, which she plucks from her own breast. This bag, when completed, is as thick as paper, is smooth within side, but rougher without. Within this they deposit their eggs; and it is almost incredible to relate the concern and industry

which they bestow in the preservation of it. They stick it by means of their glutinous fluid to the end of their body; so that the animal, when thus loaded, appears as if she had one body placed behind another. If this bag be separated from her by any accident, she employs all her assiduity to stick it again in its former situation, and seldom abandons her treasure but with her life. When the young ones are excluded from their shells, within the bag, they remain for some time in their confinement, until the female, instinctively knowing their maturity, bites open their prison, and sets them free. But her parental care does not terminate with their exclusion: she receives them upon her back for some time, until they have strength to provide for themselves, when they leave her, never to return, and each begins a separate manufactory of its own. The young ones begin to spin when they can scarcely be discerned; and prepare for a life of plunder before they have strength to overcome.

Thus there is no insect to which they are not enemies, but what is more barbarous still, spiders are the enemies of each other. M. Reaumur, who was fond of making experiments upon insects, tried to turn the labours of the spider to human advantage, and actually made a pair of gloves from their webs. For this purpose, he collected a large number of those insects together: he took care to have them constantly supplied with flies, and the ends of young feathers, fresh picked from chickens and pigeons, which being full of blood, are a diet that spiders are particularly fond of. But, notwithstanding all his care, he was soon convinced that it was impracticable to rear them, since they were of such a malignant nature, that they could never be brought to live in society; but instead of their usual food, chose to devour each other. Indeed, were it practicable to reconcile them to each other, it would require too much attendance to rear up a sufficient number to make the project any way useful. Their thread is four or five times finer than that of the silkworm; so that upon the smallest calculation, there must have been sixty thousand spiders to make a single pound of silk. That which Reaumur made use of was only the web in which they deposited their eggs, which is five times stronger than their ordinary manufacture.

Of this animal there are several kinds, slightly differing from each other, either in habits or conformation. The *water-spider* is the most remarkable of the number. This insect resembles the common spider in its appearance, except that its hinder part is made rather in the shape of a nine-pin than a ball. They differ in being able to live as well by land as

water; and in being capable of spinning as well in one element as the other. Their appearance under water is very remarkable; for though they inhabit the bottom, yet they are never touched by the element in which they reside, but are enclosed in a bubble of air that, like a box, surrounds them on every side. This bubble has the bright appearance, at the bottom, of quicksilver; and within this, they perform their several functions of eating, spinning and sleeping, without its ever bursting, or in the least disturbing their operations.

The *Tarantula* is also of this species, and deserves particular notice, only for the numerous falsehoods which have been propagated concerning it. What may be said with truth concerning it is, that it is the largest of the spider kind known in Europe, and is a native of Apulia, in Italy. Its body is three quarters of an inch long, and about as thick as a man's little finger; the colour is generally an olive brown, variegated with one that is more dusky; it has eight legs, and eight eyes, like the rest, and nippers, which are sharp and serrated; between these and the fore legs there are two little horns, or feelers, which it is observed to move very briskly when it approaches its prey. It is covered all over the body with a soft down; and propagates, as other spiders, by laying eggs. In the summer months, particularly in the dog days, the tarantula creeping among the corn, bites the mowers and passengers; but in winter it lurks in holes, and is seldom seen.

Thus far is true; but now the fable begins: for though the bite is attended with no dangerous symptoms, and will easily cure of itself, wonderful stories are reported concerning its virulence. At first the pain is scarcely felt; but a few hours after, a violent sickness is said to come on, with difficulty of breathing, fainting, and sometimes trembling. The person bit after this does nothing but laugh, dance and skip about, putting himself into the most extravagant postures; and sometimes also is seized with a most frightful melancholy. At the return of the season in which he was bit, his madness begins again; and the patient always talks of the same things. Sometimes he fancies himself a shepherd; sometimes a king; these troublesome symptoms sometimes return for several years successively, and at last terminate in death. But so dreadful a disorder has it seems not been left without a remedy; which is no other than a well played fiddle. For this purpose the medical musician plays a particular tune, famous for the cure, which he begins slow, and increases in quickness as he sees the patient affected. The patient no sooner hears the music, than he begins to dance; and continues so doing till he is all over in a sweat, which forces out the venom that appeared so

dangerous. Such are the symptoms related of the tarantula poison; but the truth is, that the whole is an imposition of the peasants upon travellers who happen to pass through that part of the country, and who procure a trifle for suffering themselves to be bitten by the tarantula. Whenever they find a traveller willing to try the experiment, they readily offer themselves; and are sure to counterfeit the whole train of symptoms which music is said to remove. It is thus that falsehoods prevail for a century or two; and mankind at last begin to wonder how it was possible to keep up the delusion so long.

The Flea. The history of those animals with which we are best acquainted is one of the first objects of our curiosity. If the flea be examined with a microscope, it will be observed to have a small head, large eyes, and a roundish body. It has two feelers, or horns, which are short, and composed of four joints; and between these lies its trunk, which it buries in the skin, and through which it sucks the blood in large quantities. The body appears to be all over curiously adorned with a suit of polished sable armour, neatly joined, and beset with multitudes of sharp pins, almost like the quills of a porcupine. It has six legs, the joints of which are so adapted, that it can, as it were, fold them up one within another; and when it leaps, they all spring out at once, whereby its whole strength is exerted, and the body raised above two hundred times its own diameter.

The young fleas are at first a sort of nits or eggs, which are round and smooth; and from these proceed white worms, of a shining pearl colour: in a fortnight's time they come to a tolerable size, and are very lively and active; but if they are touched at this time, they roll themselves up in a ball: soon after this they begin to creep like silk-worms that have no legs; and then they seek a place to lie hid in, where they spin a silken thread from their mouth, and with this they enclose themselves in a small round bag or case, as white within as writing paper, but dirty without: in this they continue for a fortnight longer: after which they burst from their confinement perfectly formed, and armed with powers to disturb the peace of an emperor.

Of the Louse. In examining the *human louse* with the microscope, its external deformity first strikes us with disgust: the shape of the fore part of the head is somewhat oblong; that of the hind part somewhat round: the skin is hard, and being stretched, transparent, with here and there

several bristly hairs: in the fore part is a proboscis or sucker, which is seldom visible: on each side of the head are antennæ, or horns, each divided into five joints, covered with bristly hair; and several white vessels are seen through these horns: behind these are the eyes, which seem to want those divisions observable in other insects, and appear encompassed with some few hairs: the neck is very short, and the breast is divided into three parts: on each side of which are placed six legs, consisting of six joints covered also with bristly hairs: the ends of the legs are armed with two smaller and larger ruddy claws, serving those insects as a finger and thumb, by which they catch hold of such objects as they approach: the end of the body terminates in a cloven tail, while the sides are all over hairy; the whole resembling clear parchment, and when roughly pressed, cracking with a noise.

When we take a closer view, its white veins, and other internal parts, appear; as likewise a most wonderful motion in its intestines, from the transparency of its external covering. When the louse feeds, the blood is seen to rush, like a torrent, into the stomach: and its greediness is so great, that the excrements contained in the intestines are ejected at the same time, to make room for this new supply.

The louse has neither beak, teeth, nor any kind of mouth. In the place of all these, it has a proboscis or trunk; or, as it may be otherwise called, a pointed hollow sucker, with which it pierces the skin, and sucks the human blood, taking that for food only. The stomach is lodged partly in the breast and back; but the greatest portion of it is in the abdomen. When it is empty, it is colourless; but when filled, it is plainly discernible, and its motion seems very extraordinary. It then appears working with very strong agitations, and somewhat resembles an animal within an animal. Superficial observers are apt to take this for the pulsation of the heart; but if the animal be observed when it is sucking, it will be found that the food takes a direct passage from the trunk to the stomach, where the remainder of the old aliment will be seen mixing with the new, and agitated up and down on every side.

If this animal be kept from food two or three days, and then placed upon the back of the hand, or any soft part of the body, it will immediately seek for food; which it will the more readily find, if the hand be rubbed till it grows red. The animal then turns its head, which lies between the two fore legs, to the skin, and diligently searches for some pore: when found, it fixes the trunk therein; and soon the

microscope discovers the blood ascending through the head, in a very rapid, and even frightful stream. The louse has at that time sufficient appetite to feed in any posture; it is then even sucking with its head downward, and its tail elevated. If, during this operation, the skin be drawn tight, the trunk is bound fast, and the animal is incapable of disengaging itself; but it more frequently suffers from its gluttony, since it gorges to such a degree, that it is crushed to pieces by the slightest impression.

There is scarcely any animal that multiplies so fast as this unwelcome intruder. It has been pleasantly said, that a louse becomes a grand-father in the space of twenty-four hours: this fact cannot be ascertained; but nothing is more true than, that the moment the nit, which is no other than the egg of the louse, gets rid of its superfluous moisture, and throws off its shell, it then begins to breed in its turn. Nothing so much prevents the increase of this nauseous animal, as cold and want of humidity; the nits must be laid in a place that is warm, and moderately moist, to produce any thing. That is the reason that many nits laid on the hairs in the night time, are destroyed by the cold of the succeeding day; and so stick for several months, till they at last come to lose even their external form.

There is scarce an animal, and scarce even a vegetable, that does not suffer under its own peculiar louse. The sheep, the horse, the hog, and the elephant, are all teased by them; the whale, the shark, the salmon, and the lobster, are not without their company; while every hot house, and every garden is infested with some peculiarly destructive. Linnæus tells us, that he once found a vegetable-louse upon some plants newly arrived from America; and willing to trace the little animal through its various stages, he brought it with him from London to Leyden, where he carefully preserved it during the winter, until it bred in the spring: but the louse it seems did not treat him with all the gratitude he expected: for it became the parent of so numerous a progeny, that it soon over-run all the physic garden of that beautiful city; and leaves, to this day, many a gardener to curse the Swede's too indulgent curiosity.

The animal which some have called the *Leaf Louse*, is of the size of a flea, and of a bright green, or bluish green colour; the body is nearly oval, and is largest and most convex on the hinder part: the breast is very small, and the head is blunt and green; the eyes may be seen very plainly, being prominent on the fore part of the head, and

of a shining black colour; near these there is a black line on each side; and the legs are very slender.

These animals are usually found upon the leaves of the orache, and other plants; and the weaker the leaves and buds are, these insects swarm upon them in greater abundance. Some plants are covered over with them; though they are not the cause of the plant's weakness, but the sign: however, by wounding and sucking the leaf, they increase the disease. They generally assume their colour from the plant on which they reside. Those that feed upon pot-herbs and plum trees, are of an ash colour; only they are greenish when they are young: those that belong to the alder and cherry-tree are black; as also those upon beans, and some other plants: those on the leaves of apples and rose trees, are white. As they leap, like grasshoppers, some place them in the number of the flea kind. The most uncommon colour is reddish: and lice of this sort may be found on the leaves of tansey; and their juice, when rubbed in the hands, tinges them with no disagreeable red. All these live upon their respective plant, and are often engendered within the very substance of the leaf.

All these bring forth their young alive; and the fœtus, when it is ready to be brought forth, entirely fills the belly of the female; its fore parts being excluded first, and then the hinder. The young one does not begin to move till the horns or feelers appear out of the body of the old one; and by the motion of these it first shews signs of life, moving them in every direction, and bending all their joints. When the horns and head are excluded, the two fore feet follow, which they move with equal agility; after this follow the middle feet, and then the hinder: still, however, the young one continues sticking to its parent, supported only at one extremity, and hanging as it were in air, until its small and soft members become hardened and fitted for self-support. The parent then gets rid of its burden by moving from the place where she was sitting, and forcing the young one to stand upon its legs, leaves it to shift for itself.

As the animal has not far to go, its provision lying beneath it, during the summer it continues to eat and creep about with great agility. But as it is viviparous, and must necessarily lurk somewhere in winter, where its body may be defended from the cold, it endeavours to secure a retreat near the trees or plants that serve to nourish it in the beginning of spring. They never hide themselves in the earth, like many other insects, because they have no part of their

bodies fitted to remove the earth; nor can they creep into every chink, as their legs are too long: besides, their bodies are so tender, that the least rough particle of the earth would hurt them. They therefore get into the deep chinks of the bark, and into the cavities of the stronger stalks, whence they sally out upon the branches and leaves, when the warmth of the sun begins to be felt. Neither the cold in the autumnal season, nor the lesser degree of heat in the spring, ever hurts them; they seldom, therefore, seek for hiding-places before the fall of the leaf, and are alert enough to take the earliest advantage of the returning spring.

Like many other insects, they cast their skins four several times; and, what is very remarkable, the males have four wings, but the females never have any. They all have long legs, not only to enable them to creep over the long hairs of plants and leaves, but also to travel from one tree to another, when they happen to stand at a distance. Their trunk or snout lies under their breast; and this they thrust into the pores of the plant to suck out the juice, for they do not gnaw them, like the caterpillar; but so hurt them by sucking, that the leaves become spotted, and as it were overrun with scabs; for which reason their edges always turn up towards the middle.

It has been said, that these insects are often carried away and devoured by ants; but this Frysch, from whom this description is taken, could never observe. The ants indeed are fond of those trees where there is a great number of those insects; but then it is only to suck the juice which flows from the leaves that have been just wounded. This more particularly happens in the heat of summer, when other moisture is wanting: however, he never found them hurting or carrying away any of these insects while alive; nor indeed were they able, for the leaf louse is more than a match for the ant at single combat. Whenever they perceive the ant approaching behind them, they kick back with their hinder feet, and thus drive off the invader, as a horse would a lion.

The three principal and constant enemies to these insects are, first, the fire-fly, which lays its eggs where these insects are in greatest numbers, which producing a worm, seizes and devours all the leaf-lice that come near it: another enemy is the worm of a peculiar kind of beetle, which destroys them in great numbers: but the most formidable of all enemies is the ichneumon fly, that seizes upon one of the largest females, and laying its egg upon her, this is hatched

into a worm, which soon devours and destroys the animal from whose body it sprung.

The Bug is another of those nauseous insects that intrude upon the retreats of mankind; and often banish that sleep, which even sorrow and anxiety permitted to approach. This, to many men, is of all insects the most troublesome and obnoxious. The night is usually the season when the wretched have rest from their labour: but this seems the only season when the bug issues from its retreats, to make its depredations. By day it lurks, like a robber, in the most secret parts of the bed; takes the advantage of every chink and cranny, to make a secure lodgment; and contrives its habitation with so much art, that scarce any industry can discover its retreat. It seems to avoid the light with great cunning; and even if candles be kept burning, this formidable insect will not issue from its hiding place. But, when darkness promises security, it then issues from every corner of the bed, drops from the tester, crawls from behind the arras, and travels, with great assiduity, to the unhappy patient, who vainly wishes for rest and refreshment. It is generally vain to destroy one only, as there are hundreds more to revenge their companion's fate; so that the person who thus is subject to be bitten, remains the whole night, like a centinel upon duty, rather watching the approach of fresh invaders, than inviting the pleasing approach of sleep.

Nor are these insects less disagreeable from their nauseous stench, than their unceasing appetite. When they begin to crawl, the whole bed is infected with the smell; but if they are accidentally killed, then it is insupportable.

These are a part of the inconveniences that result from the persecution of these odious insects; but, happily for Great Britain, they multiply less in that Island, than in any part of the Continent. In France and Italy, the beds, particularly in their inns, swarm with them; and every piece of furniture seems to afford them a retreat. They grow larger also with them than in England, and bite with more cruel appetite.

This animal, if examined minutely, appears to consist of three principal parts; the head, the corselet, and the belly. It has two brown eyes, that are very small, and a little prominent, besides two feelers, with three joints; underneath these, there is a crooked trunk, which is its instrument of torture, and which, when in motion, lies close upon the breast. The breast is a kind of ring, in which are placed the

two first pairs of legs. The belly consists of nine rings; under which are placed two pair of legs more, making six in all. Each leg has three joints, which form the thigh, the leg, and the foot, which is armed with a crooked claw, like an hook. The body is smooth except a few short hairs, that may be seen by the microscope, about the vent, and on the two last rings. Its sight is so exquisite, that the instant it perceives the light it generally makes good its retreat; and they are seldom caught, though the bed swarms with them.

Cleanliness seems to be the best antidote to remove these nauseous insects; and wherever that is wanting, their increase seems but a just punishment. Indeed, they are sometimes found in such numbers among old furniture, and neglected chambers, exposed to the south, that wanting other sustenance, they devour each other. They are also enemies to other vermin, and destroy fleas very effectually; so that we seldom have the double persecution of different vermin in the same bed. Of the bug kind Linnæus reckons up forty.

The common Wood-louse is seldom above half an inch long, and a quarter of an inch broad. The colour is of a livid black, especially when found about dung-hills, and on the ground: but those that are to be met with under tiles, and in drier places, are of the colour of the hair of an ass. It has fourteen feet, seven on each side; and they have only one joint each, which is scarcely perceivable. It has two short feelers, and the body is of an oval shape. When it is touched, it rolls itself up in a sort of ball; and the sides, near the feet, are dentated, like a saw. It is often found among rotten timber, and on decayed trees: in winter it lies hid in the crevices of walls, and all sorts of buildings. The male is easily distinguishable from the female, being less, and more slender. The eggs they lay are white and shining, like seed pearls, and are very numerous; more properly speaking, however, when excluded, the young have all the appearance of an egg, yet they are alive, and, without throwing off any shell, stir and move about with great vivacity: so that this animal may properly be said to be viviparous. The little worms at first seem scarcely able to stir; but they soon feed, and become very brisk. Of this insect Linnæus makes three species.

The Monoculus, or Arborescent Water-Flea. This animal, which is of the size of a flea, appears to the sight, unassisted by the microscope, to have but one eye; for the eyes, by reason of the smallness of the head, seem to be joined to each other: they are situated in the trunk of this insect, and the beak is likewise very small and sharp pointed.

The structure of the eye is seen by the microscope to be reticulated, or made like a net; and the trunk of this insect, by which it feeds, is not only small and sharp, but also transparent. The insects are of a blood red colour; and sometimes are seen in such multitudes on the surface of standing water, as to make it appear all over red, whence many fanciful people have thought the water to be turned into blood.

Of all parts of this animal, its branching arms, and the motion it makes with them in the water, deserve our greatest attention. By these the little creature can move in a straight line; waving its arms, as a bird does its wings in the air, sometimes upward, sometimes downward, sometimes to the right, sometimes to the left, yet still continuing to proceed in a right line. By striking the water with its arms, it can ascend with great velocity; and by striking in a contrary direction, it dives with equal ease. As these motions are very rapid, the little animal appears to jump in the water, its head always tending to the surface, and its tail stretched downward. This insect is produced from an egg, which, when excluded, is carried on the back of the female, and soon is seen floating in the water round her. Its appearance at first is that of a very small whitish insect, endued with a very nimble motion. Except in colour, it suffers no change, only continuing to grow larger and redder, as it grows old. They sometimes remain several days on the surface of the water and sometimes are seen at the bottom only; but they are never at rest. They change their skin, like most other insects; and the cast skin resembles the insect itself so exactly, that one might mistake the mask for the animal.

THE SCORPION. There is scarcely an insect without wings that is not obnoxious to man: the smallest have the power of annoying him, either by biting or stinging him; and though each is in itself contemptible, they become formidable from their numbers. But of all this class there is none so terrible as the scorpion, whose shape is hideous, whose size among the insect tribe is enormous, and whose sting is generally fatal.

The scorpion is one of the largest of the insect tribe, and not less terrible from its size than its malignity. It resembles a lobster somewhat in shape, but is infinitely more hideous. There have been enumerated nine different kinds of this dangerous insect, chiefly distinguished by their colour: there being scorpions yellow, brown, and ash-coloured; others that are the colour of rusty iron, green, pale yellow, black, claret colour, white and grey.

There are four principal parts distinguishable in this ani-

mal: the head, the breast, the belly, and the tail. The scorpion's head seems, as it were, joined to the breast; in the middle of which are seen two eyes; and a little more forward, two eyes more, placed in the fore part of the head: these eyes are so small, that they are scarcely perceivable; and it is probable the animal has but little occasion for seeing. The mouth is furnished with two jaws; the undermost is divided into two, and the parts notched into each other, which serves the animal as teeth, and with which it breaks its food, and thrusts it into its mouth: these the scorpion can at pleasure pull back into its mouth, so that no part of them can be seen. On each side of the head are two arms, each composed of four joints; the last of which is large, with strong muscles, and made in the manner of a lobster's claw. Below the breast are eight articulated legs, each divided into six joints; the two hindmost of which are each provided with two crooked claws, and here and there covered with hair. The belly is divided into seven little rings; from the lowest of which is continued a tail, composed of six joints, which are bristly, and formed like little globes, the last being armed with a crooked sting. This is that fatal instrument which renders this insect so formidable: it is long, pointed, hard and hollow; it is pierced near the base by two small holes, through which, when the animal stings, it ejects a drop of poison, which is white, caustic, and fatal. The reservoir in which this poison is kept, is a small bladder near the tail, into which the venom is distilled by a peculiar apparatus. If this bladder be gently pressed, the venom will be seen issuing out through the two holes above mentioned; so that it appears, that when the animal stings, the bladder is pressed, and the venom issues through the two apertures into the wound.

There are few animals more formidable, or more truly mischievous than the scorpion. As it takes refuge in a small place, and is generally found sheltering in houses, so it cannot be otherwise than that it must frequently sting those among whom it resides. In some of the towns of Italy, and in France, in the province of Languedoc, it is one of the greatest pests that torment mankind; but its malignity in Europe is trifling when compared to what the natives of Africa and the East are known to experience. In Batavia, where they grow twelve inches long, there is no removing any piece of furniture, without the utmost danger of being stung by them.

Bosman assures us, that, along the Gold Coast, they are often found larger than a lobster; and that their sting is inevitably fatal. In Europe, the general size of this animal does not exceed two or three inches; and its sting is very seldom found to be fatal. Maupertuis, who made several

experiments on the scorpion of Languedoc, found it by no means so invariably dangerous as it had till then been represented.

From his experiments, indeed, it appears, that many circumstances, which are utterly unknown, must contribute to give efficacy to the scorpion's venom; but whether its food, long fasting, the season, the nature of the vessels it wounds, or its state of maturity, contribute to, or retard its malignity, is yet to be ascertained by succeeding observers.

The scorpion of the tropical climates being much larger than the former, is probably much more venomous. Helbigius, however, who resided many years in the East, assures us, that he was often stung by the scorpion, and never received any material injury from the wound; a painful tumour generally ensued; but he always cured it by rubbing the part with a piece of iron or stone, as he had seen the Indians practise before him, until the flesh became insensible. Seba, Moore, and Bosman, however, give a very different account of the scorpion's malignity; and assert that, unless speedily relieved, the wound becomes fatal.

It is certain, that no animal in the creation seems endued with such an irascible nature.

Walkamer tried the courage of the scorpion against the large spider, and enclosed several of both kinds in glass vessels for that purpose.* The success of this combat was very remarkable. The spider at first used all its efforts to entangle the scorpion in its web, which it immediately began spinning; but the scorpion rescued itself from the danger, by stinging its adversary to death: it soon after cut off, with its claws, all the legs of the spider, and then sucked all the internal parts at its leisure.—If the scorpion's skin had not been hard, Walkamer is of opinion, that the spider would have obtained the victory; for he had often seen one of these spiders destroy a toad.

The fierce spirit of this animal is equally dangerous to its own species; for scorpions are the cruelest enemies to each other. Maupertuis put about an hundred of them together in the same glass; and they scarcely came into contact, when they began to exert all their rage in mutual destruction; there was nothing to be seen but one univeral carnage, without any distinction of age or sex; so that, in a few days, there remained only fourteen, which had killed and devoured all the rest.

But their unnatural malignity is still more apparent in their cruelty to their offspring. He enclosed a female scorpion,

* Ephemerides, Dec. 11, 1687. Observ. 224.

big with young, in a glass vessel, and she was seen to devour them as fast as they were excluded; there was but one only of the number that escaped the general destruction, by taking refuge on the back of its parent; and this soon after revenged the cause of its brethren, by killing the old one in its turn.

Were it worth the trouble, these animals might be kept living as long as curiosity should think proper. Their chief food is worms and insects; and upon a proper supply of these, their lives might be lengthened to their natural extent. How long that may be we are not told; but if we may argue from analogy, it cannot be less than seven or eight years; and, perhaps, in the larger kind, double that duration. As they have somewhat the form of the lobster, so they resemble that animal in casting their shell, or, more properly, their skin; since it is softer by far than the covering of the lobster, and set with hairs, which grow from it in great abundance, particularly at the joinings. The young lie in the womb of the parent, each covered up in its own membrane, to the number of forty or fifty, and united to each other by an oblong thread, so as to exhibit altogether the form of a chaplet.

There is, however, a scorpion of America, produced from the egg, in the manner of the spider. The eggs are no larger than pin's points; and they are deposited in a web, which they spin from their bodies, and carry about with them, till they are hatched. As soon as the young ones are excluded from the shell, they get upon the back of the parent, who turns her tail over them, and defends them with her sting. It seems probable, therefore, that captivity produces that unnatural disposition in the scorpion, which induces it to destroy its young; since, at liberty, it is found to protect them with such unceasing assiduity.

THE SCOLOPENDRA AND GALLY-WORM. Of these hideous and angry insects we know little, except the figure and the noxious qualities. Though with us there are insects somewhat resembling them in form, we are placed at a happy distance from such as are really formidable. With us they seldom grow above an inch long; in the tropical climates they are often found above a quarter of a yard.

The *Scolopendra* is otherwise called the *Centipes*, from the number of its feet; and it is very common in many parts of the world, especially between the tropics. Those of the East Indies, where they grow to the largest size, are about six inches long, of a ruddy colour, and as thick as a man's finger: they consist of many joints; and from each joint is a leg on

each side; they are covered with hair, and seem to have no eyes; but there are two feelers on the head, which they make use of to find out the way they are to pass; the head is very round, with two small sharp teeth, with which they inflict wounds that are very painful and dangerous. A sailor that was bit by one on board a ship, felt an excessive pain, and his life was supposed to be in danger: however, he recovered, by the application of three roasted onions to the part; and was soon quite well. Of this animal there are different kinds; some living, like worms, in holes in the earth; others under stones, and among rotten wood; so that nothing is more dangerous than removing those substances in the places where they breed.

The *Gally-worm* differs from the scolopendra in having double the number of feet; there being two on each side, to every joint of the body. Some of these are smooth, and others hairy; some are yellow, some black, and some brown. They are found among decayed trees, between the wood and the bark; as also among stones that are covered with moss. They all, when touched, contract themselves, rolling themselves up like a ball. Whatever may be their qualities in the tropical parts of the world, in Europe they are perfectly harmless; having been often handled and irritated without any vindictive consequences.

All these, as well as the scorpion, are supposed to be produced perfect from the parent, or the egg; and to undergo no changes after their first exclusion. They are seen of all sizes; and this is a sufficient inducement to suppose that they preserve their first appearance, through their whole existence. It is probable, however, that, like most of this class, they often change their skins; but of this we have no certain information.

THE LEECH, from its uses in medicine, is one of those insects that man has taken care to propagate; but, of a great variety, one kind only is considered as serviceable. The horse-leech, which is the largest of all, and grows to four inches in length, with a glossy black surface, is of no use, as it will not stick to the skin; the *snail-leech* is but an inch in length; and though it will stick, is not large enough to extract a sufficient quantity of blood from the patient; the *broad-tailed leech*, which grows to an inch and an half in length, with the back raised into a sort of a ridge, will stick but on very few occasions; it is the large *brown leech* with a whitish belly, that is made use of in medicine, and whose history best merits our curiosity.

This leech has the general figure of a worm, and is about as long as one's middle finger. Its skin is composed of rings, by means of which it is possessed of its agility, and swims in water. It contracts itself when out of water, in such a manner, that when touched, it is not above an inch long. It has a small head, and a black skin, edged with a yellow line on each side, with some yellowish spots on the back. The belly also, which is of a reddish colour, is marked with whitish yellow spots. But the most remarkable part of this animal is the mouth, which is composed of two lips, that take whatever form the insect finds convenient. When at rest, the opening is usually triangular; and within it are placed three very sharp teeth, capable of piercing not only the human skin, but also that of an horse or an ox. Still deeper in the head, is discovered the tongue, which is composed of a strong fleshy substance, and which serves to assist the animal in sucking, when it has inflicted its triple wound; for no sooner is this voracious creature applied to the skin, than it buries its teeth therein, then closes its lips round the wound which it has made; and thus, in the manner of a cupping-glass, extracts the blood as it flows to the different orifices.

In examining this animal's form farther towards the tail, it is seen to have a gullet, and an intestinal canal, into which the blood flows in great abundance. On each side of this are seen running along several little bladders, which, when the animal is empty, seem to be filled with nothing but water; but when it is gorging blood, they seem to communicate with the intestines, and receive a large portion of the blood which flows into the body. If these bladders should be considered as so many stomachs, then every leech will be found to have twenty-four. But what is most extraordinary of all in this animal's formation is, that though it takes so large a quantity of food, it has no anus or passage to eject it from the body when it has been digested. On the contrary, the blood which the leech has thus sucked remains for several months clotted within its body, blackened a little by the change, but no way putrefied, and very little altered in its texture or consistence. In what manner it passes through the animal's body, or how it contributes to its nourishment, is not easily accounted for. The water in which they are kept is very little discoloured by their continuance; they cannot be supposed to return the blood by the same passage through which it was taken in; it only remains, therefore, that it goes off through the pores of the body, and that these are sufficiently large to permit its exclusion.

But it is not in this instance alone that the leech differs from all other insects. It was remarked in a former section, that the whole insect tribe had the opening into their lungs placed in their sides; and that they breathed through those apertures as other animals through the mouth. A drop of oil poured on the sides of a wasp, a bee, or a worm, would quickly suffocate them, by stopping up the passages through which they breathe; but it is otherwise with the leech, for this animal may be immersed in oil without injury; nay it will live therein: and the only damage it will sustain is, that when taken out it will be seen to cast a fine pellucid skin, exactly of the shape of the animal, after which it is as alert and vigorous as before. It appears from this, that the leech breathes through the mouth; and, in fact, it has a motion that seems to resemble the act of respiration in more perfect animals; but concerning all this we are very much in the dark.

This leech is viviparous, and produces its young one after the other, to the number of forty or fifty at a birth. It is probable that, like the snail, each insect contains the two sexes, and that it impregnates, and is impregnated in the same manner. The young ones are chiefly found in the month of July, in shallow running waters, and particularly where they are tepified by the rays of the sun. The large ones are chiefly sought after; and being put into a glass vessel filled with water, they remain for months, nay for years, without taking any other subsistence. But they never breed in this confinement; and consequently, what regards that part of their history still remains obscure.

In this part of the world they seldom grow to above four inches; but in America and the East they are found from six to seven. Their pools there abound with them in such numbers, that it would be dangerous bathing there, if from no other consideration. Our sailors and soldiers, who the last war were obliged to walk in those countries through marshy grounds, talk with terror of the number of leeches that infested them on their march. Even in some parts of Europe they increase so as to become formidable. Sedelius, a German physician, relates that a girl of nine years old, who was keeping sheep near the city of Bomst, in Poland, perceiving a soldier making up to her, went to hide herself in a neighbouring marsh, among some bushes; but the number of leeches was so great in that place, and they stuck to her so close, that the poor creature expired from the quantity of blood which she lost by their united efforts. Nor is this much to be wondered at, since one of these insects, that, when empty, generally

weighs but a scruple, will, when gorged, weigh more than two drachms.

When leeches are to be applied, the best way is to take them from the water in which they are contained, about an hour before, for they thus become more voracious, and fasten more readily. When saturated with blood, they generally fall off of themselves; but if it be thought necessary to take them from the wound, care should be used to pull them very gently, or even to sprinkle them with salt, if they continue to adhere; for if they be plucked rudely away, it most frequently happens that they leave their teeth in the wound, which makes a very troublesome inflammation, and is often attended with danger. If they be slow in fixing to the part, they are often enticed by rubbing it with milk or blood, or water mixed with sugar. As salt is poison to most insects, many people throw it upon the leech when it has dropped from the wound, which causes it to disgorge the blood it has swallowed, and it is then kept for repeated application. They seldom, however, stick after this operation; and, as the price is but small, fresh leeches should always be applied whenever such an application is thought necessary.

CHAP. XXXVI.

The Second Order of Insects—The DRAGON FLY—*The* LION ANT—*The* GRASSHOPPER—*The Locust—The Great West Indian Locust—The House Cricket—The Wool Cricket—The Mole Cricket—The* EARWIG—*The Froth Worm—The Water Fly—The Water Scorpion—The* EPHEMARA.

WE come now to a second order of insects, that are produced from the egg, like the former, but not in a perfect state; for when first excluded they are without wings.

To this order we may, in the first place, refer the LIBELLA, or DRAGON-FLY.

Of all the flies which adorn or diversify the face of nature, these are the most various and the most beautiful; they are of all colours; green, blue, crimson, scarlet, white, &c.

They are distinguished from all other flies by the length of their bodies, the largeness of their eyes and the beautiful transparency of their wings, which are four in number.

They are seen in summer flying with great rapidity near every hedge, and by every running brook; they sometimes settle on the leaves of plants, and sometimes keep for hours together on the wing.

Dragon-flies, though there are three or four different kinds, yet agree in the most striking parts of their history, and one account may serve for all. The largest sort are generally found from two to three inches long; their tail is forked; their body divided into eleven rings; their eyes are large, horny, and transparent, divided by a number of intersections; and their wings, that always lie flat when they are at rest, are of a beautiful glossy transparency; sometimes shining like silver, and sometimes glistening like gold. Within the mouth are to be seen two teeth covered with a beautiful lip: with these the creatures bite fiercely when they are taken; but their bite is perfectly harmless.

These insects, beautiful as they are, are produced from eggs, which are deposited in the water, where they remain for some time without seeming life or motion. They are ejected by the female into the water in clusters, like a bunch of grapes, where they sink to the bottom by their natural weight, and continue in that state till the young ones find strength enough to break the shell, and to separate from each other. The form in which they first shew life is that of a worm with six legs, bearing a strong resemblance to the dragon-fly in its winged state, except that the wings are yet concealed within a sheath peculiar to this animal. The rudiments of these appear in bunches on the back, within which the wings are folded up into each other, while all the colours and varieties of painting appear transparent through the skin. These animals, upon quitting the egg, still continue in the water, where they creep and swim, but do not move swiftly. They have likewise a sharp sight, and immediately sink to the bottom, if any one comes to the places where they live, or whenever they perceive the least uncommon object. Their food at that time is soft mud and the glutinous earthy substances that are found at the bottom.

When these animals prepare to change from their reptile to their flying state, they then move out of the water to a dry place; as into grass, to pieces of wood, stone, or any thing else they meet with. There they firmly fix their acute claws; and, for a short time, continue quite immoveable, as if meditating on the change they are to undergo. It is then observed, that the skin first opens on the head and back; and out of this opening they exhibit their real head and eyes,

and at length their six legs; whilst, in the mean time, the hollow and empty skin, or slough of their legs, remains firmly fixed in its place. After this, the creature creeps forward by degrees; and by this means draws first its wings and then its body out of the skin; and proceeding a little farther, sits at rest for some time, as if immoveable. During this time the wings, which were moist and folded, begin by degrees to expand themselves, and to make smooth and even all those plaits which were laid against each other, like a closed fan. The body is likewise insensibly extended, until all the limbs have obtained their proper size and dimensions.

No animal is more amply fitted for motion, subsistence, and enjoyment. As it haunts and seeks after its food flying in the air, nature has provided it with two large eyes, which make almost the whole head, and which resemble glittering mother-of-pearl.

As the wings are long, and the legs short, they seldom walk, but are ever seen either resting or flying.

Thus they are seen, adorning the summer with a profusion of beauty, lightly traversing the air in a thousand directions, and expanding the most beautiful colours to the sun. The garden, the forest, the edges, and the rivulets, are animated by their sports; and there are few who have been brought up in the country, who have not employed a part of their childhood in the pursuit.

But while these beautiful flies appear to us so idly and innocently employed, they are in fact the greatest tyrants of the insect tribe; and, like the hawk among birds, are only hovering up and down to seize their prey. They are the strongest and the most courageous of all winged insects; nor is there one, how large soever, that they will not attack and devour. The blue fly, the bee, the wasp, and the hornet, make their constant prey; and even the butterfly, that spreads so large a wing, is often caught and treated without mercy. Their appetite seems to know no bounds; they spend the whole day in the pursuit, and have been seen to devour three times their own size in the capture of a single hour. They seize their prey flying, with their six claws, and tear it easily to pieces with their teeth, which are capable of inflicting troublesome wounds.

THE LION-ANT. Although this animal properly belongs to no order of insects, yet, as it is changed into a fly very much resembling that described in the preceding chapter, it may not be improper to give its history here.

The lion-ant, in its reptile state, is of the size of a common wood-louse, but somewhat broader. It has a pretty long head, and a roundish body, which becomes a little narrower towards the tail. The colour is a dirty grey, speckled with black, and the body is composed of several flat rings, which slip one upon another. It has six feet, four of which are fixed to the breast, and two to the neck. The head is small and flat, and before there are two little smooth horns and feelers, which are hard, about a quarter of an inch long, and crooked at the ends. At the basis of the feelers there are two small black lively eyes, by which it can see the smallest object, as is easily discovered by its starting from every thing that approaches.

To a form so unpromising, and so ill provided for the purposes of rapacity, this animal unites the most ravenous appetites in nature; but to mark its imbecility still stronger, as other animals have wings or feet to enable them to advance towards their prey, the lion-ant is unprovided with such assistance from either. It has legs, indeed; but these only enable it to run backward, so that it could as soon die as make the smallest progressive motion. Thus, famished and rapacious as it ever seems, its prey must come to it, or rather into the snare provided for it, or the insidious assassin must starve.

But Nature, that has denied it strength or swiftness, has given it an equivalent in cunning, so that no animal fares more sumptuously, without ever stirring from its retreat. For this purpose it chooses a dry sandy place, at the foot of a wall, or under some shelter, in order to preserve its machinations from the rain. The driest and most sandy spot is the most proper for it; because a heavy clogged earth would defeat its labour. When it goes about to dig the hole where it takes its prey, it begins to bend the hinder part of its body, which is pointed, and thus works backward: making, after several attempts, a circular furrow, which serves to mark out the size of the hole it intends making, as the ancients marked out the limits of a city with a plough. Within this first furrow it digs a second, then a third, and afterwards others, which are always less than the preceding. Then it begins to deepen its hole, sinking lower and lower into the sand, which it throws with its horns, or feelers, towards the edges, as we see men throw up sand in a gravel pit. Thus, by repeating its labours all around, the sand is thrown up in a circle about the edge of the pit, until the hole is quite completed. This hole is always formed in a

perfect circle; and the pit itself resembles the inside of an inverted funnel.

The work being thus with great labour finished the insidious insect places itself in ambush, hiding itself in the bottom under the sand in such a manner, that its two horns encircle the bottom of the pit. All the sides of this pit-fall are made of the most loose and crumbling materials; so that scarcely any insect can climb up that has once got down to the bottom. Conscious of this, the lion-ant remains in patient expectation, ready to profit by that accident which throws some heedless little animal into his den. If then, by misfortune, an ant, a wood-louse, or a small caterpillar, walks too near the edge of the precipice, the sand gives way beneath them, and they fall to the bottom of the pit, where they meet inevitable destruction. The fall of a single grain of sand gives the murderer notice at the bottom of his cave; and it never fails to sally forth to seize upon its prey. It happens sometimes, however, that the ant or the wood-louse is too nimble, and runs up the side of the pit-fall before the other can make ready to seize it. The lion-ant has then another contrivance, still more wonderful than the former; for, by means of its broad head and feelers, it has a method of throwing up a shower of sand, which falls upon the struggling captive with tremendous weight, and once more crushes it down to the bottom.

When the prey is reduced to a husk, and nothing but the external form remains, the next care of the murderer is to remove the body from its cell; therefore, taking up the wasted trunk with its feelers, it throws it, with wonderful strength, at least six inches from the edge of its hole; and then patiently sets about mending the breaches which its fortifications had received in the last engagement.

When the lion-ant attains a certain age, in which it is to change into another form, it then leaves off its usual rapacious habits.

These animals are produced in autumn, and generally live a year, and perhaps two, before they assume a winged form.

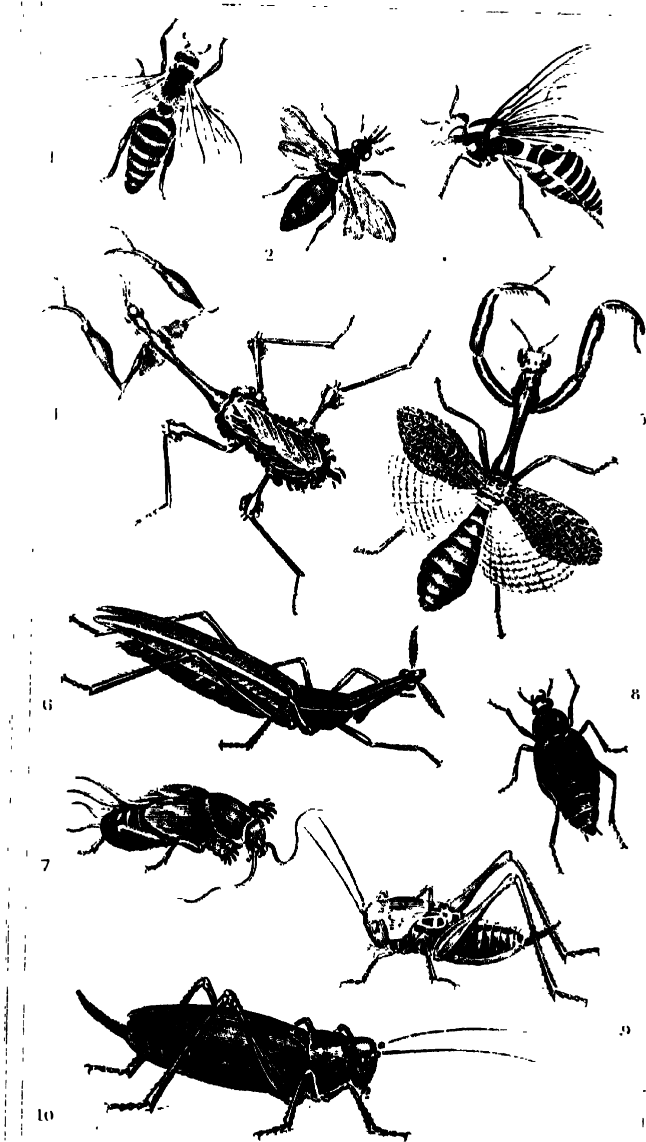
When the time of change approaches, if the insect finds its little cell convenient, it seeks no other: if it is obliged to remove, after furrowing up the sand, it hides itself under it, horns and all. It there spins a thread, in the manner of the spider; which being made of a glutinous substance, and being humid from the moisture of its body, sticks to the little particles of sand among which it is spun; and in proportion as it is thus excluded, the insect rolls up its web,

sand and all, into a ball, of which itself is the centre. This ball is about half an inch in diameter; and within it the insect resides, in an apartment sufficiently spacious for all its motions. The outside is composed of sand and silk; the inside is lined with silk only, of a fine pearl colour, extremely delicate, and perfectly beautiful. But though the work is so curious within, it exhibits nothing to external appearance, but a lump of sand; and thus escapes the search of birds, that might otherwise disturb the inhabitant within.

The insect continues thus shut up for six weeks or two months; and gradually parts with its eyes, its feelers, its feet, and its skin; all which are thrust into a corner of the inner apartment, like a rag. The insect then appears almost in its winged state, except that there is a thin skin which wraps up the wings, and which appears to be nothing else but a liquor dried on their outside. Still, however, the little animal is too delicate and tender to venture from its retreat; but continues inclosed for some time longer: at length, when the members of this new insect have acquired the necessary consistence and vigour, it tears open its lodging, and breaks through its wall. For this purpose it has two teeth, like those of grasshoppers, with which it eats through, and enlarges the opening till it gets out. Its body, which is turned like a screw, takes up no more than the space of a quarter of an inch; but when it is unfolded, it becomes half an inch in length; while its wings, that seemed to occupy the smallest space, in two minutes time unfold, and become longer than the body. In short, it becomes a large and beautiful fly, of the libella kind, with a long, slender body, of a brown colour; a small head, with large bright eyes, long slender legs, and four large, transparent, reticulated wings. The rest of its habits resemble that insect whose form it bears; except, that instead of dropping its eggs in the water, it deposits them in sand, where they are soon hatched into that rapacious insect, so justly admired for its method of catching its prey.

THE GRASSHOPPER, the LOCUST, the CRICKET, &c. That animal which is called the *Grasshopper* with us, differs greatly from the cicada of antiquity; for as our insect is active enough in hopping through the long grass, whence it has taken its name, the cicada had not this power, but either walked or flew. The little hissing note also of our grasshopper is very different from the song of the cicada, which was louder, and far more musical.

Of this variegated tribe, the *little Grasshopper*, that breeds



1 Queen Bee _ 2 Common Bee _ 3 Wasp 4 5 6 Locusts
7 Mole Cricket 8 [illegible] 9. 10 [illegible]

in such plenty in every meadow, and that continues its chirping through the summer, is best known to us; and, by having its history, we shall be possessed of that of all the rest. This animal is of the colour of green leaves, except a line of brown which streaks the back, and two pale lines under the belly, and behind the legs. It may be divided into the head, the corselet, and the belly. The head is oblong, regarding the earth, and bearing some resemblance to that of a horse. Its mouth is covered by a kind of round buckler jutting over it, and armed with teeth of a brown colour, hooked at the points. Within the mouth is perceivable a large reddish tongue, fixed to the lower jaw. The feelers, or horns, are very long, tapering off to a point; and the eyes are like two black specks, a little prominent. The corselet is elevated, narrow, armed above and below, by two serrated spines. The back is armed with a strong buckler, to which the muscles of the legs are firmly bound, and round these muscles are seen the vessels by which the animal breathes, as white as snow. The last pair of legs are much longer and stronger than the first two pair, fortified by thick muscles, and very well formed for leaping. It has four wings; the anterior ones springing from the second pair of legs, the posterior from the third pair. The hinder wings are much finer, and more expansive, than the foremost, and are the principal instruments of its flight. The belly is considerably large, composed of eight rings, and terminated by a forky tail, covered with down, like the tail of a rat. When examined internally, besides the gullet, we discovered a small stomach; and behind that a very large one, wrinkled and furrowed within side; lower down there is still a third; so that it is not without reason, that all the animals of this order are said to chew the cud, as they so much resemble ruminating animals in their internal conformation.

A short time after the grasshopper assumes its wings, it fills the meadow with its note; which, like that among birds, is a call to courtship. The male only of this tribe is vocal; and upon examining it at the base of the wings, there will be found a little hole in its body, covered with a fine transparent membrane. This is thought, by Linnæus, to be the instrument it employs in singing; but others are of opinion, the sound is produced by rubbing its hinder legs against each other: however this may be, the note of one male is seldom heard, but it is returned by another; and the two little animals, after many mutual insults of this kind, are seen to meet and fight desperately. The female is generally the reward of victory; for, after the combat, the male seizes

her with his teeth behind the neck, and thus keeps her for several hours.

Towards the latter end of autumn, the female prepares to deposit her burden; and her body is then seen greatly distended with her eggs, which she carries to the number of a hundred and fifty. In order to make a proper lodgment in the earth for them, Nature has furnished her with an instrument at her tail, somewhat resembling a two edged sword, which she can sheathe and unsheathe at pleasure; with this she pierces the earth as deep as she is able; and into the hole which her instrument has made, she deposits her eggs, one after the other.

Having thus provided for the continuatión of her posterity, the animal herself does not long survive; but, as the winter approaches, she dries up, seems to feel the effects of age, and dies from a total decay. Some, however, assert, that she is killed by the cold; and others, that she is eaten by worms: but certain it is, that neither the male nor female are ever seen to survive the winter. In the mean time, the eggs which have been deposited continue unaltered, either by the severity of the season, or the retardation of the spring. They are of an oval figure, white, and of the consistence of horn: their size nearly equals that of a grain of anise: they are enveloped in the body within a covering, branched all over with veins and arteries; and when excluded, they crack, on being pressed between the fingers: their substance within is a whitish, viscous, and transparent fluid.

Generally, about the beginning of May, every egg produces an insect, about the size of a flea; these at first are of a whitish colour; at the end of two or three days they turn black; and soon after they become of a reddish brown. They appear, from the beginning, like grasshoppers wanting wings; and hop among the grass, as soon as excluded, with great agility.

Yet still they are by no means arrived at their state of full perfection; although they bear a strong resemblance to the animal in its perfect form. They want, or seem to want, the wings, which they are at last seen to assume; and can only hop among the grass, without being able to fly. The wings, however are not wanting, but are concealed within four little bunches, that seem to deform the sides of the animal: there they lie rolled up in a most curious manner; and occupying a smaller space than one could conceive. Indeed, all insects, whatever transmutations they seem to undergo, are yet brought forth with those very limbs, parts and wings,

which they afterward seem to acquire. In the most helpless caterpillar, there are still to be seen the rudiments of that beautiful plumage which it afterwards expands when a butterfly: and though many new parts seem unfolded to the view, the animal acquires none but such as it was from the beginning possessed of.

The grasshopper, that for above twenty days from its exclusion has continued without the use of its wings, which were folded up to its body, at length prepares for its emancipation, and for a life of greater liberty and pleasure. To make the proper dispositions for the approaching change, it ceases from its grassy food, and seeks about for a convenient place, beneath some thorn or thistle, that may protect it from an accidental shower. The same laborious writhings and workings, heavings and palpitations, which we have remarked in every other insect upon an approaching change, are exhibited in this.

At length, the skin covering the head and breast is seen dividing above the neck; the head is seen issuing out first from the bursting skin; the efforts still continuing, the other parts follow successively; so that the little animal with its long feelers, legs and all, works its way from the old skin, that remains fixed to the thistle or the thorn. It is indeed, inconceivable how the insect thus extricates itself from so exact a sheath as that which covered every part of its body.

The grasshopper, thus disengaged from its outer skin, appears in its perfect form; but then so feeble, and its body so soft and tender, that it may be moulded like wax. It is no longer of that obscure colour which it exhibited before, but of a greenish white, which becomes more vivid as the moisture on the surface is dried away. Still, however, the animal continues to shew no signs of life, but appears quite spent and fatigued with its labour for more than an hour together. During this time, the body is drying, and the wings unfolding to their greatest expansion; and the curious observer will perceive them, fold after fold, opening to the sun, till at last they become longer than the two hinder legs. The insect's body also is lengthened during this operation, and it becomes much more beautiful than before.

These insects are generally vocal in the midst of summer; and they are heard at sun-setting much louder than during the heats of the day. They feed upon grass; and, if their belly be pressed, they will be seen to return the juices of the plants they have last fed upon. Though unwilling to fly, and slow in flight, particularly when the weather is moist or cool, they are sometimes seen to fly to considerable distances. If they are caught by one of the hinder legs, they quickly

disengage themselves from it, and leave the leg behind them. This, however, does not grow again, as with crabs or spiders; for as they are animals but of a single year's continuance, they have not sufficient time for repairing these accidental misfortunes. The loss of their leg also prevents them from flying; for, being unable to lift themselves in the air, they have not room upon the ground for the proper expansion of their wings. If they be handled roughly, they will bite very fiercely; and when they fly, they make a noise with their wings. They generally keep in the plain, where the grass is luxuriant, and the ground rich ard fertile: there they deposit their eggs, particularly in those cracks which are formed by the heat of the sun.

Such are the habits and nature of these little vocal insects, that swarm in our meadows, and enliven the landscape. The larger kinds only differ from them in size, in rapidity of flight, and the powers of injuring mankind, by swarming upon the productions of the earth. The quantity of grass which a few grasshoppers that sport in the fields can destroy is trifling; but when a swarm of *locusts* two or three miles long, and several yards deep, settle upon a field, the consequences are frightful. The annals of every country are marked with the devastation which such a multitude of insects produces; and though they seldom visit Europe in such dangerous swarms as formerly, yet, in some of the southern kingdoms, they are still formidable. Those which have at uncertain intervals visited Europe, in our memory, are supposed to have come from Africa, and the animal is called the Great Brown Locust. It was seen in several parts of England, in the year 1748, and many dreadful consequences were apprehended from its appearance. This insect is about three inches long; and has two horns, or feelers, an inch in length. The head and horns are of a brownish colour; it is blue about the mouth, as also on the inside of the larger legs. The shield that covers the back is greenish; and the upper side of the body brown, spotted with black, and the under side purple. The upper wings are brown, with small dusky spots, with one larger at the tips; the under wings are more transparent, and of a light brown, tinctured with green, but there is a dark cloud of spots near the tips.

There is no animal in the creation that multiplies so fast as these, if the sun be warm, and the soil in which their eggs are deposited be dry.

The scripture, which was written in a country where the locust made a distinguished feature in the picture of Nature, has given us several very striking images of this animal's

numbers and rapacity. It compares an army, where the numbers are almost infinite, to a swarm of locusts; it describes them as rising out of the earth, where they are produced; as pursuing a settled march to destroy the fruits of the earth, and co-operate with divine indignation.

When the locusts take the field, as we are assured, they have a leader at their head, whose flight they observe, and pay a strict attention to all his motions. They appear at a distance, like a black cloud, which, as it approaches, gathers upon the horizon, and almost hides the light of the day. It often happens, that the husbandman sees this imminent calamity pass away without doing him any mischief; and the whole swarm proceed onward to settle upon the labours of some less fortunate country. But wretched is the district upon which they settle: they ravage the meadow and the pasture ground; strip the trees of their leaves, and the garden of its beauty; the visitation of a few minutes destroys the expectations of a year; and a famine but too frequently ensues. In their native tropical climates, they are not so dreadful as in the southern parts of Europe. There, though the plain and the forest be stripped of their verdure, the power of vegetation is so great, that an interval of three or four days repairs the calamity; but our verdure is the livery of a season; and we must wait till the ensuing spring repairs the damage. Besides, in their long flights to this part of the world, they are famished by the tediousness of their journey, and are therefore more voracious wherever they happen to settle. But it is not by what they devour that they do so much damage as by what they destroy. Their very bite is thought to contaminate the plant, and to prevent its vegetation. To use the expression of the husbandman, they burn whatever they touch; and leave the marks of their devastation for two or three years ensuing. But if they be noxious while living, they are still more so when dead; for wherever they fall, they infect the air in such a manner, that the smell is insupportable.

Orosius tells us, that in the year of the world 3800, there was an incredible number of locusts which infected Africa; and, after having eaten up every thing that was green, they flew off, and were drowned in the African sea; where they caused such a stench, that the putrefying bodies of hundreds of thousands of men could not equal it.

In the year 1690, a cloud of locusts was seen to enter Russia in three different places; and thence to spread themselves over Poland and Lithunia, in such astonishing multitudes, that the air was darkened, and the earth covered with their numbers. In some places they were seen lying dead

heaped upon each other four deep; in others, they covered the surface like a black cloth: the trees bent beneath their weight; and the damage which the country sustained exceeded computation. In Barbary their numbers are formidable, and their visits are frequent. In the year 1724, Dr. Shaw was a witness in that country of their devastations. Their first appearance was about the latter end of March, when the wind had been southerly for some time. In the beginning of April, their numbers were so vastly increased, that, in the heat of the day, they formed themselves into large swarms, which appeared like clouds, and darkened the sun. In the middle of May, they began to disappear, retiring into the plains to deposit their eggs. In the next month, being June, the young brood began to make their appearance, forming many compact bodies of several hundred yards square; which afterwards marching forward, climbed the trees, walls, and houses, eating every thing that was green in their way. The inhabitants, to stop their progress, laid trenches all over their fields and gardens, filling them with water. Some placed large quantities of heath, stubble, and such like combustible matter, in rows, and set them on fire, on the approach of the locusts; but all this was to no purpose; for the trenches were quickly filled up, and the fires put out by the vast number of swarms that succeeded each other. A day or two after one of these was in motion, others that were just hatched came to glean after them, gnawing off the young branches, and the very bark of the trees. Having lived near a month in this manner, they arrived at their full growth, and threw off their worm-like state, by casting their skins. To prepare themselves for this change, they fixed their hinder feet to some bush or twig, or corner of a stone, when immediately, by an undulating motion used on this occasion, their heads would first appear, and soon after the rest of their bodies. The whole transformation was performed in seven or eight minutes' time; after which, they were a little while in a languishing condition; but as soon as the sun and air had hardened their wings, and dried up the moisture that remained after casting of their sloughs, they returned again to their former greediness, with an addition both of strength and agility. But they did not continue long in this state before they were entirely dispersed; after laying their eggs, directing their course northward, and probably perished in the sea. It is said, that the holes these animals make, to deposit their eggs, are four feet deep in the ground; the eggs are about fourscore in number, of the size of carraway comfits, and bundled up together in clusters.

In some parts of the world, the inhabitants turn what seems a plague to their own advantage. Locusts are eaten by the natives in many kingdoms of the East: and are caught in small nets provided for that purpose. They parch them over the fire in an earthen pan; and when their wings and legs are fallen off, they turn reddish, of the colour of boiled shrimps. Dampier has eaten them thus prepared, and thinks them a tolerable dish. The natives of Barbary also eat them fried with salt; and they are said to taste like cray-fish.

There is a locust in Tonquin, about the thickness of the top of a man's finger, and as long as the first joint. It breeds in the earth, in low grounds, and in the months of January and February, which is the season for taking them, they issue from the earth in vast swarms. At first they can hardly fly, so that they often fall into the rivers in great numbers: however, the natives in these months watch the rivers, and take them up in multitudes in small nets. They either eat them fresh, boiled on the coals, or pickle them for keeping. They are considered as a great delicacy in that part of the world, as well by the rich as the poor. In the countries where they are eaten, they are regularly brought to market, and sold as larks or quails in Europe. They must have been a common food with the Jews, as Moses, in the book of Leviticus, permits them to eat four different kinds of this animal, which he takes care to specify. This dish, however, has not yet made its way into the kitchens of the luxurious in Europe; and though we may admire the delicacies of the East we are as yet happily deprived of the power of imitation.

Of all animals, however, of this noxious tribe, the *Great West Indian Locust*, individually considered, is the most formidable. It is about the thickness of a goose-quill, and the body is divided into nine or ten joints, in the whole about six or seven inches long. It has two small eyes, standing out of the head like those of crabs, and two feelers like long hair. The whole body is studded with small excrescences, which are not much bigger than the points of pins. The shape is roundish, and the body diminishes in circumference to the tail, which is forked into two horns. Between these, there is a sort of sheath, containing a small dangerous sting. If any person happens to touch this insect, he is sure to be stung; and is immediately taken with a shivering and trembling all over the body; which, however, may soon be put a stop to, by rubbing the place that was affected with a little palm oil.

From the locust we descend to the cricket, which is a very inoffensive animal. Though there is a species of this insect

that lives entirely in the woods and fields, yet that with which we are best acquainted is the *House-cricket*, whose voice is so well known behind a country fire in a winter's evening. There is something so unusual in hearing a sound while we do not see the animal producing it, nor discover the place whence it comes, that among the country people the chirping of the cricket is always held ominous; and whether it deserts the fire-side, or pays an unexpected visit, the credulous peasantry always find something to be afraid of.

The cricket very much resembles the grasshopper in its shape, its manner of ruminating, its voice, its leaping, and methods of propagation. It differs in its colour, which is uniformly of a rusty brown; in its food, which is more various; and in its place of residence, which is most usually in the warmest chinks behind a country hearth. They are, in some measure obliged to the bad masonry employed in making peasant's houses for their retreats. The smallest chink serves to give them shelter, and where they once make their abode they are sure to propagate. They are of a most chilly nature, seldom leaving the fire-side; and if undisturbed, are seen to hop from their retreats to chirp at the blaze in the chimney. The *Wood-cricket* is the most timorous animal in nature; but the chimney cricket, being used to noises, disregards them. Whether the voice of this animal is formed in the same manner with that of the grasshopper is not yet ascertained; nor do we well know the use of this voice, since anatomical inspection has not been able to discover the smallest organs of hearing. Still, however, we can make no doubt of their power of distinguishing sounds, though probably not in the same manner with the more perfect ranks of nature. Certain it is, that they have been often heard to call, and this call is as regularly answered by another, although none but the males are vocal.

As the cricket lives chiefly in the dark, so its eyes seem formed for the gloominess of its abode; and those who would surprise it, have only to light a candle unexpectedly by which it is dazzled, and cannot find the way back to its retreat. It is a very voracious little animal, and will eat bread, flour, and meat; but it is particularly fond of sugar. They never drink, but keep for months together at the back of the chimney, where they could possibly have had no moisture. The warmth of their situation only serves to increase their mirth and loquacity.

The great Scaliger was particularly delighted with the chirping of crickets, and kept several of them for his amusement, enclosed in a box, which he placed in a warm

situation. Others, on the contrary, think there is something ominous and melancholy in the sound, and use every endeavour to banish this insect from their houses.

Ledelius tells us of a woman who was very much incommoded by crickets, and tried, but in vain, every method of banishing them from her house. She at last, accidentally succeeded; for having one day invited several guests to her house, where there was a wedding, in order to increase the festivity of the entertainment, she procured drums and trumpets to entertain them. The noise of these was so much greater than what the little animals were used to, that they instantly forsook their situation, and were never heard in that mansion more.

But of all the cricket kind, that which is called the *Mole Cricket* is the most extraordinary. This animal is the largest of all the insects with which we are acquainted in this country, being two inches and an half in length, and three quarters of an inch in breadth. The colour is of a dusky brown; and, at the extremity of the tail, there are two hairy excrescences, resembling, in some degree, the tail of a mouse. The body consists of eight scaly joints, or separate folds, is brown on the upper part, and more deeply tinged below. The wings are long, narrow, and terminate in a sharp point, each having a blackish line running down it: however, when they are extended, they appear to be much broader than could at first sight be supposed. The shield of the breast is of a firm texture, of a blackish colour, and hairy. The fore-feet, which are this animal's principal instruments of burrowing into the earth, are strong, webbed, and hairy; it generally, however, runs backward; but it is commonly under ground, where it burrows even faster than a mole. It is thought also to be amphibious; and capable of living under water, as well as under ground.

Of all insects, this is the most detested by gardeners, as it chiefly resides in that ground which lies light, and where it finds sufficient plenty under the surface, Thus, in a single night's time, it will run along a furrow which has been newly sown, and rob it of all its contents. Its legs are formed in such a manner, that it can penetrate the earth in every direction; before, behind, and above it. At night it ventures from its underground habitation, and, like the cricket, has its chirping call.

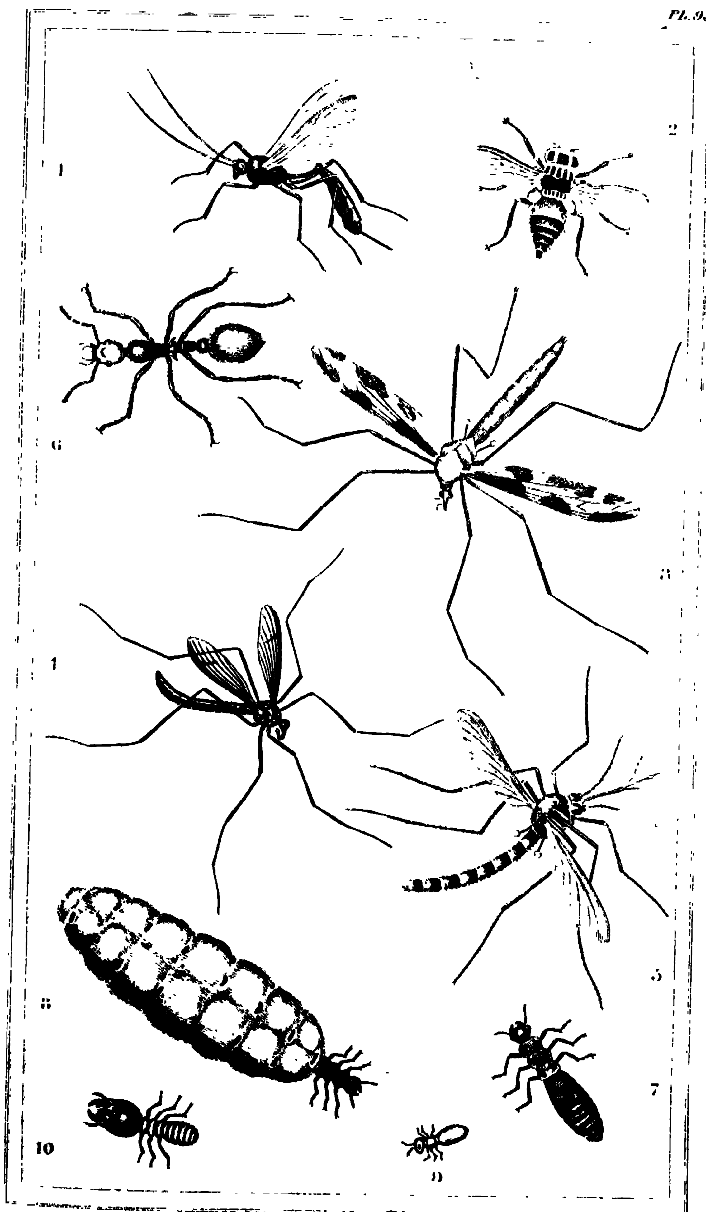
Nothing can exceed the care and assiduity which these animals exhibit in the preservation of their young. Where-ever the nest is placed, there seems to be a fortification, avenues, and entrenchments, drawn round it: there are

numberless winding ways that lead to it, and a ditch drawn about it, which few of its insect enemies are able to pass. But their care is not confined to this only; for, at the approach of winter, they carry their nest entirely away, and sink it deeper in the ground, so that the frost can have no influence in retarding the young brood from coming to maturity. As the weather grows milder, they raise their magazine in proportion; till, at last, they bring it as near the surface as they can, to receive the genial influence of the sun, without wholly exposing it to view; yet should the frost unexpectedly return, they sink it again as before.

Of the Earwig. We should still keep in memory, that all insects of the second order, though not produced quite perfect from the egg, yet want very little of their perfection, and require but a very small change to arrive at that state which fits them for flight and generation.

Of all this class of insects, the earwig undergoes the smallest change. This animal is so common, that it scarce needs a description: its swiftness, in the reptile state, is not less remarkable than its indefatigable velocity when upon the wing. That it must be very prolific, appears from its numbers; and that it is very harmless, every one's experience can readily testify. It is provided with six feet, and two feelers: the tail is forked; and with this it often attempts to defend itself against every assailant. But its attempts are only the threats of impotence; they draw down the resentment of powerful animals, but no way serve to defend it. The deformity of its figure, and its slender make, have also subjected it to an imputation, which, though entirely founded in prejudice, has more than once procured its destruction. It is supposed, as the name imports, that it often enters into the ears of people sleeping; thus causing madness, from the intolerable pain, and soon after death itself.

Indeed, the French name, which signifies the ear-piercer, urges the calumny against this harmless insect in very plain terms: yet nothing can be more unjust; the ear is already filled with a substance which prevents any insect from entering; and, besides, it is well lined and defended with membranes, which would keep out any little animal, even though the ear-wax were away. These reproaches, therefore, are entirely groundless: but it were well if the accusations which gardeners bring against the earwig were as slightly founded. There is nothing more certain, than that it lives among flowers, and destroys them. When fruit also has been wounded by flies, the earwig generally comes in for a second



1. Ichneumon _2. Gad Fly 3.&4. Tipula _5. Gnat 6. Common Ant 7. Termes or Ant of Africa (wing'd) _8. Queen Ant pregnant 9. Labourer _10. Soldier

feast, and sucks those juices which they first began to broach. Still, however, this insect is not so noxious as it would seem; and seldom is found but where the mischief has been originally begun by others. Like all of this class, the earwig is hatched from an egg. As there are various kinds of this animal, so they choose different places to breed in: in general, however, they lay their eggs under the bark of plants, or in the clefts of trees, when beginning to decay. They proceed from the egg in that reptile state in which they are most commonly seen; and, as they grow larger, the wings bound under the skin begin to burgeon. It is amazing how very little room four large wings take up before they are protruded; for no person could ever conceive such an expansion of natural drapery could be rolled up in so small a packet. The sheath in which they are enveloped, folds and covers them so neatly, that the animal seems quite destitute of wings; and even when they are burst from their confinement, the animal, by the power of the muscles and joints which it has in the middle of its wing , can closely fold them into a very narrow compass. When the earwig has become a winged insect, it flies in pursuit of the female, ceases to feed, and is wholly employed in the business of propagation. It lives, in its winged state, but a few days; and, having taken care for the continuance of posterity, dries up, and dies, to all appearance consumptive.

To this order of insects we may also refer the Cuckow Spit, or *Froth Worm*, that is often found hid in that frothy matter which we find on the surface of plants. It has an oblong, obtuse body; and a large head, with small eyes. The external wings, for it has four, are of a dusky brown colour, marked with two white spots: the head is black. The spume in which it is found wallowing, is all of its own formation, and very much resembles frothy spittle. It proceeds from the vent of the animal, and other parts of the body; and, if it be wiped away, a new quantity will be quickly seen ejected from the little animal's body. Within this spume, it is seen in time to acquire four tubercles on its back, wherein the wings are enclosed: these bursting, from a reptile it becomes a winged animal; and thus rendered perfect, it flies to meet its mate, and propagate its kind.

The Water Tipula also belongs to this class. It has an oblong, slender body, with four feet fixed upon the breast, and four feelers near the mouth. It has four weak

wings, which do not at all seem proper for flying, but leaping only.

But what this insect chiefly demands our attention for, is, the wonderful lightness wherewith it runs on the surface of the water, so as scarcely to put it in motion. It is sometimes seen in rivers, and on their banks, especially under shady trees; and generally in swarms of several together.

The common WATER-FLY also breeds in the same manner with those above-mentioned. This animal is by some called the Notonecta, because it does not swim in the usual manner, upon its belly, but on its back: nor can we help admiring that fitness in this insect for its situation, as it feeds on the under side of plants, which grow on the surface of the water; and therefore it is thus formed with its mouth upwards, to take its food with greater convenience and ease.

We may also add the *Water Scorpion*, which is a larger insect, being near an inch in length, and about half an inch in breadth. Its body is nearly oval, but very flat and thin; and its tail long and pointed. The head is small; and the feelers appear like legs, resembling the claws of a scorpion, but without sharp points. This insect is generally found in ponds; and is extremely tyrannical and rapacious.

It destroys, like a wolf among sheep, twenty times as many as its hunger requires. One of these, when put into a bason of water, in which were thirty or forty worms of the libellula kind, each as large as itself, destroyed them all in a few minutes, getting on their backs, and piercing with its trunk through their body. These animals, however, though so formidable to others, are nevertheless themselves greatly overrun with a little kind of louse, about the size of a nit, which very probably repays the injury which the water-scorpion inflicts upon others.

The water-scorpions live in the water by day; out of which they rise in the dusk of the evening into the air, and so flying from place to place, often betake themselves, in quest of food, to other waters. The insect, before its wings are grown, remains in the place where it was produced; but when come to its state of perfection, sallies forth in search of a companion of the other sex, in order to continue its noxious posterity.

The last insect we shall add to this second order is the EPHEMERA; which though not strictly belonging to it, yet seems more properly referred to this rank than any other.

Indeed, we must not attend to the rigour of method, in an history where nature seems to take delight to sport in variety.

That there should be a tribe of flies, whose duration extends but to a day, seems at first surprising; but the wonder will increase, when we are told, that some of this kind seem to be born and die in the space of a single hour. The reptile, however, from which they are bred, is by no means so short lived; but is sometimes seen to live two years, and many times three years together.

All ephemeras, of which there are various kinds, are produced from the egg, in the form of worms; whence they change into a more perfect form; namely, that of aurelias, which is a kind of middle state between a worm and a fly: and thence they take their last mutation, which is into a beautiful fly, of longer or shorter duration, according to its kind.

The ephemera, in its fly state, is a very beautiful winged insect, and has a strong similitude to the butterfly, both from its shape and its wings. It is about the size of a middling butterfly; but its wings differ in not being covered with the painted dust, with which those of butterflies are adorned, and rendered opaque, for they are very transparent, and very thin. These insects have four wings, the uppermost of which are much the largest: when the insect is at rest, it generally lays its wings, one over the other, on the back. The body is long, being formed of six rings, that are larger at the origin than near the extremity; and from this a tail proceeds, which is longer than all the rest of the fly, and consists sometimes of three threads of an equal length, or sometimes of two long and one short.

The reptile which is to become a fly, and which is granted so long a term, when compared to its latter duration, is an inhabitant of the water, and bears a very strong resemblance to fishes, in many particulars, having gills by which it breathes at the bottom, and also the tapering form of aquatic animals. These insects have six scaly legs, fixed on their corselet. Their head is triangular; the eyes are placed forward, and may be distinguished by their largeness and colour. The mouth is furnished with teeth, and the body consists of six rings; that next the corselet being largest, but growing less and less to the end: the last ring is the shortest, from which the three threads proceed, which are as long as the whole body. Thus we see, that the reptile bears a very strong resemblance to the fly; and only requires wings, to be very near its perfection.

As there are several kinds of this animal, their aurelias are consequently of different colours: some yellow, some brown

and some cream-coloured. Some of these also bore themselves cells at the bottom of the water, from which they never stir out, but feed upon the mud composing the walls of their habitation, in contented captivity; others, on the contrary, range about, go from the bottom to the surface, swim between two waters, quit that element entirely to feed upon plants by the river side, and then return to their favourite element, for safety and protection.

The peculiar signs whereby to know that these reptiles will change into flies in a short time, consists in a protuberance of the wings on the back. About that time, the smooth and depressed form of the upper part of the body is changed into a more swollen and rounder shape: so that the wings are, in some degree, visible through the external sheath that covers them. As they are not natives of England, he who would see them in their greatest abundance, must walk, about sun-set, along the banks of the Rhine, or the Seine, near Paris; where, for about three days, in the midst of the summer, he will be astonished at their numbers and assiduity. The thickest descent of the flakes of snow in winter seems not to equal their number; the whole air seems alive with the new-born race, and the earth itself is all over covered with their remains. The aurelias, or reptile insects, that are as yet beneath the surface of the water, wait only for the approach of evening to begin their transformation The most industrious shake off their old garments about eight o'clock; and those who are the most tardy, are transformed before nine.

We have already seen that the operation of change in other insects is laborious and painful; but with these nothing seems shorter, or performed with greater ease. The aurelias are scarce lifted above the surface of the water, than their old sheathing skin bursts; and through the cavity which is thus formed, a fly issues, whose wings, at the same instant are unfolded, and at the same time lift it into the air.

Millions and millions of aurelias rise in this manner to the surface; and at once become flies, and fill every quarter with their flutterings. But all these sports are shortly to have an end; for as the little strangers live but an hour or two, the whole swarm soon falls to the ground, and covers the earth, like a deep snow, for several hundred yards, on every side of the river. Their numbers are then incredible, and every object they touch becomes fatal to them; for they instantly die, if they even hit against each other.

At this time the males and females are very differently employed. The males, quite inactive, and apparently without desires, seem only born to die: no way like the males of

other insects; they neither follow the opposite sex, nor bear any enmity to each other: after fluttering for an hour or two, they drop upon land, without seeming to receive wings for any other purpose but to satisfy an idle curiosity. It is otherwise with the females; they are scarce risen from the surface of the water, and have dried their wings, but they hasten to drop their eggs back again. If they happen also to flutter upon land, they deposit their burden in the place where they drop.

Of all insects, this appears to be the most prolific; and it would seem that there was a necessity for such a supply, as, in its reptile state, it is the favourite food of every kind of fresh-water fish. It is in vain that these little animals form galleries at the bottom of the river, whence they seldom remove; many kinds of fish break in upon their retreats, and thin their numbers. For this reason, fishermen are careful to provide themselves with these insects, as the most grateful bait; and thus turn the fish's rapacity to its own destruction.

But though the usual date of these flies is two or three hours at farthest, there are some kinds that live several days; and one kind in particular, after quitting the water, has another case or skin to get rid of. These are often seen in the fields and woods, distant from the water; but they are more frequently found in its vicinity. They are often found sticking upon walls and trees; and frequently with the head downwards, without changing place, or having any sensible motion. They are then waiting for the moment when they shall be divested of their last incommodious garment, which sometimes does not happen for two or three days together.

CHAP. XXXVII.

Of Insects of the Third Order—CATERPILLARS—*Change to the Aurelia*—*To the Butterfly*—MOTHS—*Singular Cause for the Destruction of Caterpillars*—*The* SILKWORM—*Mode of rearing it*—*Its changes.*

CATERPILLARS may be easily distinguished from worms or maggots by the number of their feet; and by their producing butterflies or moths. When the sun calls up vegetation, and vivifies the various eggs of insects, the caterpillars are the first that are seen, upon almost every vegetable and

tree, eating its leaves, and preparing for a state of greater perfection. They have feet both before and behind; which not only enable them to move forward by a sort of steps made by their fore and hinder parts, but also to climb up vegetables, and to stretch themselves out from the boughs and stalks, to reach their food at a distance. All of this class have from eight feet, at the least, to sixteen; and this may serve to distinguish them from the worm tribe, that never have so many. The animal into which they are converted, is always a butterfly or a moth; and these are always distinguished from other flies, by having their wings covered over with a painted dust, which gives them such various beauty. The wings of flies are transparent, as we see in the common flesh fly; while those of beetles are hard, like horn: from such the wing of a butterfly may be easily distinguished; and words would obscure their differences.

When the caterpillar first bursts from the egg, it is small and feeble; its appetites are in proportion to its size, and it seems to make no great consumption: but as it increases in magnitude, it improves in its appetites; so that, in its adult caterpillar state, it is the most ravenous of all animals whatsoever. A single caterpillar will eat double its own weight of leaves in a day, and yet seem no way disordered by the meal. What would mankind do, if their oxen or their horses were so voracious!

The body of the caterpillar, when anatomically considered, is found composed of rings, whose circumference is pretty near circular or oval. They are generally twelve in number, and are all membranaceous; by which caterpillars may be distinguished from any other insect, that nearly resemble them in form. The head of the caterpillar is connected to the first ring by the neck, which is generally so short and contracted, that it is scarcely visible. All the covering of the head in caterpillars seems to consist of shell; and they have neither upper nor under jaw, for they are both placed rather vertically, and each jaw armed with a large thick tooth, which is singly equal to a number. With these the animals devour their food in such amazing quantities; and, with these, some of the kind defend themselves against their enemies. Though the mouth be kept shut, the teeth are always uncovered; and while the insect is in health, they are seldom without employment. Whatever the caterpillar devours, these teeth serve to chop into small pieces, and render the parts of the leaf fit for swallowing. Many kinds while they are yet young, eat only the succulent part of the leaf, and leave all the fibres untouched; others, however, attack the whole leaf, and eat it

clean away. One may be amused, for a little time, in observing the avidity with which they are seen to feed; some are seen eating the whole day; others have their hours of repast; some choose the night, and others the day. When the caterpillar attacks a leaf, it places its body in such a manner, that the edge of the leaf shall fall between its feet, which keeps it steady, while the teeth are employed in cutting it: these fall upon the leaf, somewhat in the manner of a pair of gardener's shears; and every morsel is swallowed as soon as cut. Some caterpillars feed upon leaves so very narrow, that they are not broader than their mouths; in this case the animal is seen to devour it from the point, as we would eat a radish.

As there are various kinds of caterpillars, the number of their feet are various; some having eight, and some sixteen. Of these feet, the six foremost are covered with a sort of shining gristle; and are therefore called the shelly legs. The hindmost feet, whatever be their number, are soft and flexible, and are called membranaceous. Caterpillars also, with regard to their external figure, are either smooth or hairy. The skin of the first kind is soft to the touch, or hard, like shagreen; the skin of the latter is hairy, and, as it were, thorny; and generally, if handled, stings like nettles.

Caterpillars, in general, have six small black spots, placed on the circumference of the fore ring, and a little to the side of the head. Three of these are larger than the rest, and are convex and transparent: these Reaumur takes to be the eyes of the caterpillar; however, most of these reptiles have very little occasion for sight, and seem only to be directed by their feeling.

But the parts of the caterpillar's body which most justly demand our attention, are the stigmata, as they are called; or those holes on the sides of its body, through which the animal is supposed to breathe. All along this insect's body, on each side, these holes are easily discoverable. They are eighteen in number, nine on a side, rather nearer the belly than the back; a hole for every ring, of which the animal's body is composed, except the second, the third, and the last. These oval openings may be considered as so many mouths through which the insect breathes; but with this difference, that as we have but one pair of lungs, the caterpillar has no less than eighteen. It requires no great anatomical dexterity to discover these lungs in the larger kind of caterpillars: they appear, at first view, to be hollow cartilaginous tubes, and of the colour of mother-of-pearl. These tubes are often seen to unite with each other; some are perceived to open into the intestines; and some go to different parts of the surface of the

body. That these vessels serve to convey the air, appears evidently, from the famous experiment of Malpighi; who, by stopping up the mouths of the stigmata with oil, quickly suffocated the animal, which was seen to die convulsed the instant after. In order to ascertain his theory, he rubbed oil upon other parts of the insect's body, leaving the stigmata free; and this seemed to have no effect upon the animal's health, but it continued to move and eat as usual: he rubbed oil on the stigmata of one side, and the animal underwent a partial convulsion, but recovered soon after. However, it ought to be observed that air is not so necessary to these as to the nobler ranks of animals, since caterpillars will live in an exhausted receiver for several days together; and though they seem dead at the bottom, yet, when taken out, recover, and resume their former vivacity.

If the caterpillar be cut open longitudinally along the back, its intestines will be perceived running directly in a straight line from the mouth to the anus. They resemble a number of small bags opening into each other; and strengthened on both sides by a fleshy cord, by which they are united. These insects are, upon many occasions, seen, to cast forth the internal coat of their intestines with their food, in the changes which they so frequently undergo. But the intestines take up but a small part of the animal's body, if compared to the fatty substance in which they are involved. This substance changes its colour when the insect's metamorphosis begins to approach; and from white it is usually seen to become yellow. If to these parts, we add the caterpillar's implements for spinning, (for all caterpillars spin at one time or another) we shall have a rude sketch of this animal's conformation.

The life of a caterpillar seems one continued succession of changes; and it is seen to throw off one skin only to assume another; which also is divested in its turn: and thus for eight or ten times successively.

How laborious soever this operation may be, it is performed in the space of a minute; and the animal, having thrown off its old skin, seems to enjoy new vigour, as well as to have acquired colouring and beauty. Sometimes it happens that it takes a new appearance and colours very different from the old. Those that are hairy, still preserve their covering, although their ancient skins seems not to have lost a single hair; every hair appears to have been drawn like a sword from the scabbard. The fact, however is, that a new crop of hair grows between the old skin and the new, and probably helps to throw off the external covering.

The caterpillar having in this manner continued for several

days feeding, and at intervals casting its skin, begins at last to prepare for its change into an aurelia.

Preparatory to this important change, the caterpillar most usually quits the plant or tree on which it fed; or at least attaches itself to the stalk or the stem, more gladly than the leaves. It forsakes its food, and prepares, by fasting, to undergo its transmutation.

Those of them which are capable of spinning themselves a web, set about this operation; those which have already spun await the change in the best manner they are able. The web or cone, with which some cover themselves, hides the aurelia contained within from the view; but in others, where it is more transparent, the caterpillar, when it has done spinning, strikes in the claws of the two feet under the tail, and afterwards forces in the tail itself, by contracting those claws, and violently striking the feet one against the other. If, however, they be taken from the web at this time, they appear in a state of great languor; and, incapable of walking, remain on that spot where they are placed. In this condition they remain one or two days, preparing to change into an aurelia; somewhat in the manner they made preparations for changing their skin. They then appear with their bodies bent into a bow, which they now and then are seen to straighten: they make no use of their legs; but, if they attempt to change place, do it by the contortions of their body.

In proportion as their change into an aurelia approaches, their body becomes more and more bent; while their extensions and convulsive contractions become more frequent. The hinder end of the body is the part which the animal first disengages from its caterpillar skin; that part of the skin remains empty, while the body is drawn up towards the head. In the same manner they disengage themselves from the two succeeding rings; so that the animal is then lodged entirely in the fore part of its caterpillar covering; that half which is abandoned, remains flaccid and empty; while the fore part, on the contrary, is swollen and distended. The animal, having thus quitted the hinder part of its skin, to drive itself up into the fore part, still continues to heave and work as before; so that the skull is soon seen to burst into three pieces, and a longitudinal opening is made in the three first rings of the body, through which the insect thrusts forth its naked body, with strong efforts. Thus, at last, it entirely gets free from its caterpillar skin, and for ever forsakes its most odious reptile form.

The caterpillar, thus stripped of its skin for the last time, is now become an aurelia, in which the parts of the future

butterfly are all visible; but in so soft a state that the smallest touch can discompose them. The animal is now become helpless and motionless.

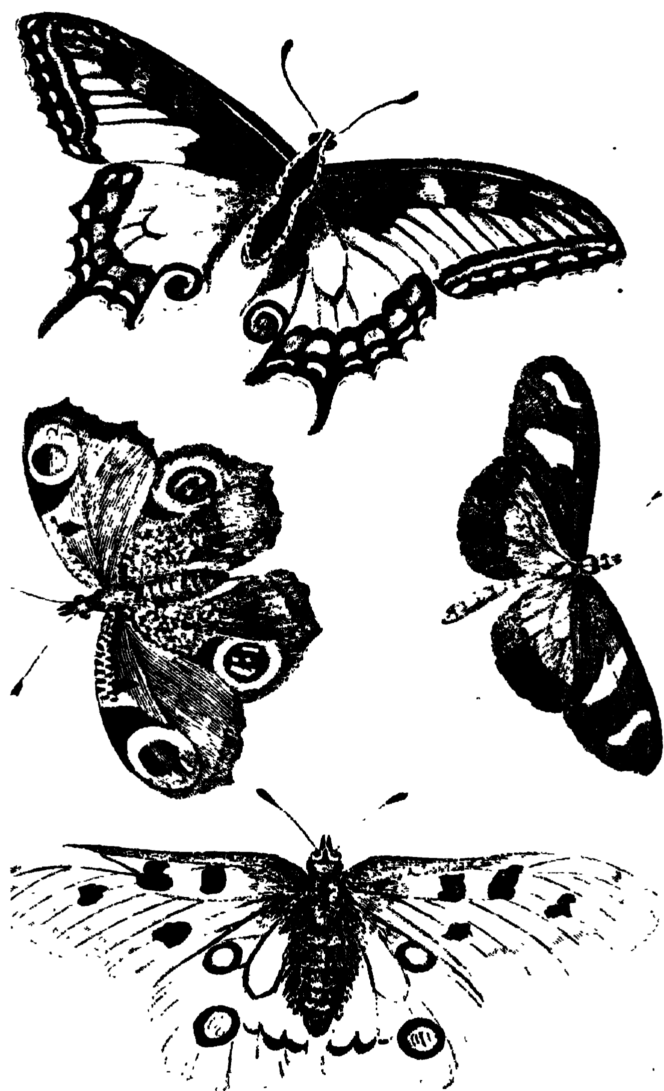
Immediately after being stripped of its caterpillar skin, it is of a green colour, especially in those parts which are distended by an extraordinary afflux of animal moisture; but in ten or twelve hours after being thus exposed, its parts harden, and the air forms its external covering into a firm crust.

From the beautiful and resplendent colour, with which it is thus sometimes adorned, some authors have called it a chrysalis, implying a creature made of gold.

The butterfly does not continue so long under the form of an aurelia, as one would be apt to imagine. In general, those caterpillars that provide themselves with cones, continue within them but a few days after the cone is completely finished. Some, however, remain buried in this artificial covering for eight or nine months, without taking the smallest sustenance during the whole time; and though in the caterpillar state no animals were so voracious, when thus transformed, they appear a miracle of abstinence. In all, sooner or later, the *butterfly* bursts from its prison: not only that natural prison which is formed by the skin of the aurelia, but also from that artificial one of silk, or any other substance in which it has enclosed itself.

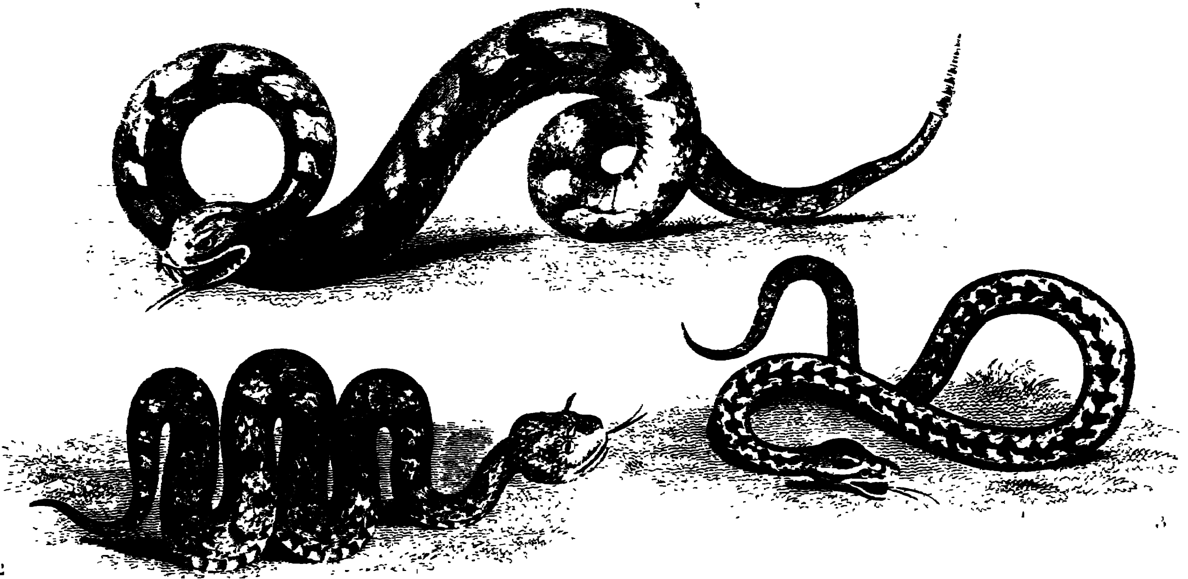
If the animal be shut up within a cone, the butterfly always gets rid of the natural internal skin of the aurelia, before it eats its way through the external covering which its own industry has formed round it. In order to observe the manner in which it thus gets rid of the aurelia covering, we must cut open the cone, and then we shall have an opportunity of discovering the insect's efforts to emancipate itself from its natural shell. When this operation begins, there seems to be a violent agitation in the humours contained within the little animal's body.

The skin of the head and legs first separates; then the skin at the back flies open, and, dividing into two regular portions, disengages the back and wings: then there likewise happens another rupture, in that portion which covered the rings of the back of the aurelia. After this, the butterfly, as if fatigued with its struggles, remains very quiet for some time, with its wings pointed downwards, and its legs fixed in the skin which it has just thrown off. At first sight, the animal, just permitted the use of its wings, seems to want them entirely; they take up such little room, that one would wonder where they were hidden. But soon after they expand so rapidly, that the eye can scarcely attend their unfolding.



Butterflies.

PL 91



Nor is it the wings alone that are thus increased; all their spots and paintings, before so minute as to be scarcely discernible, are proportionably extended; so that, what a few minutes before seemed only a number of confused, unmeaning points, now become distinct and most beautiful ornaments.

The wing, at the instant it is freed from its confinement, is considerably thicker than afterwards; so that it spreads in all its dimensions, growing thinner as it becomes broader. If one of the wings be plucked from the animal just set free, it may be spread by the fingers, and it will soon become as broad as the other, which has been left behind. As the wings extend themselves so suddenly, they have not yet had time to dry; and accordingly appear like pieces of wet paper, soft, and full of wrinkles In about half an hour, they are perfectly dry, their wrinkles entirely disappear, and the little animal assumes all its splendour.

The number of these beautiful animals is very great; and though Linnæus has reckoned up above seven hundred and sixty different kinds, the catalogue is still very incomplete. Every collector of *butterflies* can shew undescribed species, and such as are fond of minute discovery, can here produce animals that have been examined only by himself. In general, however, those of the warmer climates are larger and more beautiful than such as are bred at home.

The wings of butterflies, as was observed, fully distinguish them from flies of every other kind. They are four in number; and though two of them be cut off, the animal can fly with the two others remaining. They are, in their own substance, transparent; but owe their opacity to the beautiful dust with which they are covered: if we regard the wing of a butterfly with a good microscope, we shall perceive it studded over with a variety of little grains of different dimensions and forms, generally supported upon a footstalk, regularly laid upon the whole surface. The wing itself is composed of several membranes, which render the construction very strong, though light; and though it be covered over with thousands of these scales or studs, yet its weight is very little increased by the number. The animal is with ease enabled to support itself a long while in the air, although its flight be not very graceful. When it designs to fly to a considerable distance, it ascends and descends alternately; going sometimes to the right, sometimes to the left, without any apparent reason. Upon closer examination, however, it will be found that it flies thus irregularly in pursuit of its mate: and as dogs bait and quarter the ground in pursuit of their game, so these insects

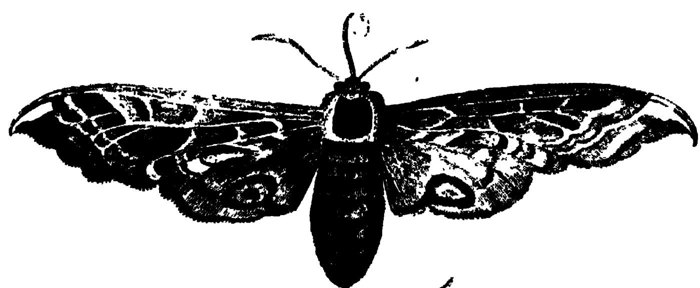
traverse the air in quest of their mates, whom they can discover at more than a mile distance.

If we prosecute our description of the butterfly, the animal may be divided into three parts; the head, the corselet, and the body.

The body is the hinder part of the butterfly, and is composed of rings, which are generally concealed under long hair with which that part of the animal is clothed. The corselet is more solid than the rest of the body, because the fore wings, and the legs are fixed therein. The legs are six in number, although four only are made use of by the animal; the two fore legs being often so much concealed in the long hair of the body, that it is sometimes difficult to discover them.

But leaving the other parts of the butterfly, let us turn our attention particularly to the head. The eyes of butterflies have not all the same form; for, in some they are large, in others small; in some they are the largest portion of a sphere, in others they are but a small part of it, and just appearing from the head. In all of them, however, the outward coat has a lustre, in which may be discovered the various colours of the rainbow. When examined a little closely, it will be found to have the appearance of a multiplying glass; having a great number of sides, or facets, in the manner of a brilliant cut diamond. In this particular, the eye of the butterfly, and of most other insects, entirely correspond; and Leuwenhoek pretends, there are above six thousand facets on the cornea of a flea. These animals, therefore, see not only with great clearness, but view every object multiplied in a surprising manner. Puget adapted the cornea of a fly in such a position, as to see objects through it by the means of a microscope; and nothing could exceed the strangeness of its representations; a soldier, who was seen through it, appeared like an army of pigmies: for while it multiplied, it also diminished the object; the arch of a bridge exhibited a spectacle more magnificent than human skill could perform; the flame of a candle seemed a beautiful illumination. It still, however, remains a doubt, whether the insect sees objects singly, as with one eye, or whether every facet is itself a complete eye, exhibiting its own object distinct from all the rest.

Butterflies, as well as most other flying insects, have two instruments, like horns, on their heads, which are commonly called feelers. They differ from the horns of greater animals in being moveable at their base; and in having a great number of joints, by which means the insect is enabled to turn them in every direction. Those of butterflies are placed at the top of the head, pretty near the external edge of each eye. What








Moths

with their Caterpillars & Aurelia

the use of these instruments may be, which are thus formed with so much art, and by a workman who does nothing without reason, is as yet unknown to man. They may serve to guard the eye; they may be of use to clean it; or they may be the organ of some sense of which we are ignorant; but this is only explaining one difficulty by another.

We are not so ignorant of the uses of the trunk, which few insects of the butterfly kind are without. This instrument is placed exactly between the eyes; and when the animal is not employed in seeking its nourishment, it is rolled up like a curl. A butterfly, when it is feeding, flies round some flower, and settles upon it. The trunk is then uncurled, and thrust out either wholly or in part; and is employed in searching the flower to its very bottom, let it be ever so deep. This search being repeated seven or eight times, the butterfly then passes to another; and continues to hover over those agreeable to its taste, like a bird over its prey. This trunk consists of two equal hollow tubes, nicely joined to each other, like the pipes of an organ.

This tribe of insects has been divided into Diurnal and Nocturnal flies; or, more properly speaking, into *butterflies* and *moths;* the one only flying by day, the other most usually on the wing in the night. They may be easily distinguished from each other, by their horns or feelers; those of the butterfly being clubbed or knobbed at the end; those of the moth, tapering finer and finer to a point. To express it technically—the feelers of butterflies are clavated; those of moths, are filiform.

The butterflies, as well as the moths, employ the short life assigned them in a variety of enjoyments. Their whole time is spent either in quest of food, which every flower offers; or in pursuit of the female, whose approach they can often perceive at above two miles distance. Their sagacity in this particular is not less astonishing than true; but by what sense they are thus capable of distinguishing each other at such distances is not easy to conceive. It cannot be by the sight, since such small objects as they are must be utterly imperceptible, at half the distance at which they perceive each other: it can scarcely be the sense of smelling, since the animal appears to have no organs for that purpose.

The general rule among insects is, that the female is larger than the male; and this obtains particularly in the tribe we are describing. The body of the male is smaller and slenderer; that of the female, more thick and oval. The eggs of the female butterflies are disposed in the body like a bed of

chaplets; which, when excluded, are usually oval, and of a whitish colour: some, however, are quite round; and others flatted, like a turnip. The covering or shell of the egg, though solid, is thin and transparent; and in proportion as the caterpillar grows within the egg, the colours change, and are distributed differently. The butterfly seems very well instructed by nature in its choice of the plant, or leaf, where it shall deposit its burden. Each egg contains but one caterpillar; and it is requisite that this little animal, when excluded should be near its peculiar provision. All the eggs of butterflies are attached to the leaves of the favourite plant, by a sort of size or glue; where they continue, unobserved, unless carefully sought after. The eggs are sometimes placed round the tender shoots of plants, in the form of bracelets, consisting of above two hundred in each, and generally surrounding the shoot like a ring upon a finger. Some butterflies secure their eggs from the injuries of air, by covering them with hair, plucked from their own bodies, as birds sometimes seen to make their nests; so that their eggs are thus kept warm, and also entirely concealed.

The maxim which has been often urged against man, that he, of all other animals, is the only creature that is an enemy to its own kind, and that the human species only are found to destroy each other, has been adopted by persons who never considered the history of insects. Some of the caterpillar kind in particular, that seem fitted only to live upon leaves and plants, will, however, eat each other; and the strongest will devour the weak, in preference to their vegetable food. That which lives upon the oak, is found to seize any of its companions, which it conveniently can, by the first rings, and inflict a deadly wound; it then feasts in tranquillity on its prey, and leaves nothing of the animal but the husk.

But it is not from each other they have most to fear, as in general they are inoffensive; and many of this tribe are found to live in a kind of society. Many kind of flies lay their eggs either upon, or within their bodies; and as these turn into worms, the caterpillar is seen to nourish a set of intestine enemies within its body, that must shortly be its destruction. Nature having taught flies, as well as other animals, the surest method of perpetuating their kind. "Towards the end of August," says Reaumur, "I perceived a little fly, of a beautiful gold colour, busily employed in the body of a large caterpillar, of that kind which feeds upon cabbage. I gently separated that part of the leaf on which these insects were placed, from the rest of the plant, and placed it where I might observe them more at my ease. The fly, wholly

taken up by the business in which it was employed, walked along the caterpillar's body, now and then remaining fixed to a particular spot. Upon this occasion, I perceived it every now and then dart a sting, which it carried at the end of its tail, into the caterpillar's body, and then drew it out again, to repeat the same operation in another place. It was not difficult for me to conjecture the business which engaged this animal so earnestly; its whole aim was to deposit its eggs in the caterpillar's body; which was to serve as a proper retreat for bringing them to perfection. The reptile thus rudely treated, seemed to bear all very patiently, only moving a little when stung too deeply; which, however, the fly seemed entirely to disregard. I took particular care to feed this caterpillar: which seemed to me to continue as voracious and vigorous as any of the rest of its kind. In about ten or twelve days, it changed into an aurelia, which seemed gradually to decline, and died: upon examining its internal parts, the animal was entirely devoured by worms; which, however, did not come to perfection, as it is probable they had not enough to sustain them within."

THE SILKWORM. Though silk was anciently brought in small quantities to Rome, yet it was so scarce as to be sold for its weight in gold; and was considered such a luxurious refinement in dress, that it was infamous for a man to appear in habits of which silk formed but half the composition. It was most probably brought among them from the remotest parts of the East; since it was, at the time of which we are speaking, scarcely known even in Persia.

The silkworm is a large caterpillar, of a whitish colour, with twelve feet, and producing a butterfly of the moth kind. There are two methods of breeding silkworms; for they may be left to grow, and remain at liberty upon the trees where they are hatched; or they may be kept in a place built for that purpose, fed every day with fresh leaves. The first method is used in China, Tonquin, and other hot countries; but to breed them in Europe, they must be sheltered and protected from every external injury. For this purpose, a room is chosen, with a south aspect; and the windows are so well glazed, as not to admit the least air; the walls are well built, and the planks of the floor exceeding close, so as to admit neither birds nor mice, nor even so much as an insect. In the middle there should be four pillars erected, or four wooden posts, so placed as to form a pretty large square. Between these are different stories made with osier hurdles; and under each hurdle there should be a floor, with

an upright border all round. These hurdles and floors must hang upon pullies, so as to be placed or taken down at pleasure.

When the worms are hatched, some tender mulberry leaves are provided, and placed in the cloth or paper box in which the eggs were laid, and which are large enough to hold a great number. When they have acquired some strength, they must be distributed on beds of mulberry leaves, in the different stories of the square in the middle of the room, round which a person may freely pass on every side. They will fix themselves to the leaves, and afterwards to the sticks of the hurdles, when the leaves are devoured. They have then a thread, by which they can suspend themselves on occasion, to prevent any shock by a fall. Care must be taken that fresh leaves be brought every morning, which must be strewed very gently and equally over them; upon which the silkworms will forsake the remainder of the old leaves, which must be carefully taken away, and every thing kept very clean; for nothing hurts these insects so much as moisture and uncleanliness. For this reason, the leaves must be gathered when the weather is dry, and kept in a dry place, if it be necessary to lay in a store. As these animals have but a short time to live, tney make use of every moment, and almost continually are spinning, except at those intervals when they change their skins. If mulberry leaves be difficult to be obtained, the leaves of luttuce or holly-hock will sustain them; but they do not thrive so well upon their new diet; and their silk will neither be so copious, nor of so good a quality.

Though the judicious choice and careful management of their diet is absolutely necessary, yet there is another precaution of equal importance, which is to give them air, and open their chamber windows at such times as the sun shines warmest.

The worm at the time it bursts the shell, is extremely small, and of a black colour; but the head is of a more shining black than the rest of the body; some days after they begin to turn whitish, or of an ash-coloured grey After the skin begins to grow too rigid, or the animal is stinted with it, the insect throws it off, and appears clothed anew: it then becomes larger and much whiter, though it has a greenish cast: after some days, which are more or less, according to the different heats of the climate, or to the quality of the food, it leaves off eating, and seems to sleep for two days together: then it begins to stir, and puts itself into violent motions, till the skin falls off the second time,

and is thrown aside by the animal's feet. All these changes are made in three weeks or a month's time; after which it begins to feed once more, still in its caterpillar form, but a good deal differing from itself before its change. In a few days' time it seems to sleep again; and, when it awakes, it again changes its clothing, and continues feeding as before. When it has thus taken a sufficiency of food, and its parts are disposed for assuming the aurelia form, the animal forsakes, for the last time, all food and society, and prepares itself a retreat to defend it from external injuries, while it is seemingly deprived of life and motion.

This retreat is no other than its cone or ball of silk, which Nature has taught it to compose with great art; and within which it buries itself, till it assumes its winged form. This cone or ball is spun from two little longish kinds of bags that lie above the intestines, and are filled with a gummy fluid, of a marigold colour. This is the substance of which the threads are formed; and the little animal is furnished with a surprising apparatus for spinning it to the degree of fineness which its occasions may require. This instrument in some measure resembles a wire-drawer's machine, in which gold or silver threads are drawn to any degree of minuteness; and through this the animal draws its thread with great assiduity. As every thread proceeds from two gum bags, it is probable that each supplies its own; which, however, are united, as they proceed from the animal's body. If we examine the thread with a microscope it will be found that it is flatted on each side, and grooved along its length: whence we may infer, that it is doubled just upon leaving the body; and that the two threads stick to each other by that gummy quality of which they are possessed. Previous to spinning its web, the silkworm seeks out some convenient place to erect its cell, without obstruction. When it has found a leaf, on a chink fitted to its purpose, it begins to writhe its head in every direction, and fastens its thread on every side to the sides of its retreat. Though all its first essays seem perfectly confused, yet they are not altogether without design; there appears indeed no order or contrivance in the disposal of its first threads: they are by no means laid artfully over each other; but are thrown out at random, to serve as an external shelter against rain; for nature having appointed the animal to work upon trees in the open air, its habits remain, though it is brought up in a warm apartment.

Malpighi pretends to have observed six different layers in a single cone of silk: but what may be easily observed is, that it is composed externally of a kind of rough cotton-like

substance, which is called floss; within the thread is more distinct and even; and next the body of the aurelia, the apartment seems lined with a substance of the hardness of paper, but of a much stronger consistence. It must not be supposed, that the thread which goes to compose the cone, is rolled round, as we roll a bobbin; on the contrary, it lies upon it in a very irregular manner, and winds off now from one side of the cone, and then from the other. This whole thread, if measured, will be found about 300 yards long: and so fine, that eight or ten of them are generally rolled off into one by the manufacturers. The cone, when completed, is in form like a pigeon's egg, and more pointed at one end than the other: at the smaller end, the head of the aurelia is generally found; and this is the place that the insect, when converted into a moth, is generally seen to burst through.

It is generally a fortnight or three weeks before the aurelia is changed into a moth, but no sooner is the winged insect completely formed, than having divested itself of its aurelia skin, it prepares to burst through its cone, or outward prison; for this purpose it extends its head towards the point of the cone, butts with its eyes, which are rough, against the lining of the cell, wears it away, and at last pushes forward, through a passage which is small at first, but which enlarges as the animal increases its efforts for emancipation; while the tattered remnants of its aurelia skin lie in confusion within the cone, like a bundle of dirty linen.

The animal, when thus set free from its double confinement, appears exhausted with fatigue, and seems produced for no other purpose but to transmit a future brood. It neither flies nor eats; there are few however, of these animals suffered to come to a state of maturity; for as their bursting through the cone destroys the silk, the manufacturers take care to kill the aurelia, by exposing it to the sun, before the moth comes to perfection. This done, they take off the floss, and throw the cones into warm water, stirring them till the first thread offers them a clue for winding all off. They generally take eight of the silken threads together; the cones being still kept under water, till a proper quantity of the silk is wound off; however, they do not take all; for the latter parts grow weak, and are of a bad colour. As to the paper like substance which remains, some stain it with a variety of colours, to make artificial flowers, others let it lie in the water, till the glutinous matter which cements it is all dissolved; it is then carded like wool, spun with a wheel, and converted into silk stuffs of an inferior kind.

CHAP. XXXVIII.

Of the fourth order of Insects—The BEE—*Foreign Bees—The Humble Bee—The Wood Bee—The Mason Bee—The Ground Bee—The Leaf-cutting Bee—The Wall Bee—The* WASP—*The Solitary Wasp—The* ICHNEUMON FLY—*The* ANT—*The white, green and black Ants—The* BEETLE—*The May Bug—The Tumble-dung—The King of the Beetles—The Elephant Beetle—The Glow-worm—The Cantharides—The Kermes—The Cochineal—The Gall Insect—The* GNAT—*The* TIPULA.

IN the foregoing part we treated of caterpillars changing into butterflies; in the present will be given the history of grubs changing into their corresponding winged animals. These, like the former, undergo their transformation, and appear as grubs or maggots, and at last as winged insects. Some of these have four transparent wings, as bees; some have two membraneous cases to their wings, as beetles; and some have but two wings, which are transparent as ants.

THE BEE. Of this insect the account given us by Reaumur is sufficiently minute; and, if true, sufficiently wonderful: but many of the facts which he relates were doubted by those who are most conversant with bees; and some of them actually declared not to have a real existence in nature.

It is unfortunate, therefore, for those whose method demands an history of bees, that they are unfurnished with those materials which have induced so many observers to contradict so great a naturalist. His life was spent in the contemplation; and it requires an equal share of attention, to prove the error of his discoveries. Without entering, therefore, into the dispute, we will take him for our guide; and just mention those particulars in which succeeding observers have begun to think him erroneous.

There are three different kinds of bees in every hive. First, the labouring bees, which make up the far greatest number, and are thought to be neither male nor female, but merely born for the purposes of labour and continuing the breed, by supplying the young with provision, while yet in their helpless state. The second sort are the drones; they are of a darker colour, longer, and more thick by one third than the former: they are supposed to be the males; and there is not above a hundred

of them in a hive of seven or eight thousand bees. The third sort are still fewer in number: some assert, that there is not above one in every swarm; but this, later observers affirm not to be true, there being sometimes five or six in the same hive. These are called queen-bees, and are said to lay all the eggs from which the whole swarm is hatched in the season.

In examining the structure of the common working bee, the first remarkable part that offers is the trunk, which serves to extract the honey from flowers. It is not formed, like that of other flies, in the manner of a tube, by which the fluid is to be sucked up: but like a besom, to sweep, or a tongue, to lick it away. The animal is furnished also with teeth, which serve it in making wax, which is also gathered from flowers, like honey. In the thighs of the hind legs there are two cavities, edged with hair; and into these, as into a basket, the animal sticks as pellets. Thus employed, the bee flies from flower to flower, increasing its store, and adding to its stock of wax; until the ball upon each thigh becomes as big as a grain of pepper: by this time, having got a sufficient load, it returns, making the best of its way to the hive.

The belly of the bee is divided into six rings, which sometimes shorten the body, by slipping one over the other. It contains within it, besides the intestines, the honey-bag, the venom-bag, and the sting. The honey-bag is as transparent as crystal, containing the honey that the bee has brushed from the flowers: of which the greater part is carried to the hive, and poured into the cells of the honey-comb: while the remainder serves for the bee's own nourishment: for, during summer, it never touches what has been laid up for the winter. The sting, which serves to defend this little animal from its enemies, is composed of three parts: the sheath, and two darts, which are extremely small and penetrating. Both the darts have several small points or barbs, like those of a fish-hook, which render the sting more painful, and make the darts rankle in the wound. Still, however, this instrument would be very slight, did not the bee poison the wound. The sheath, which has a sharp point, makes the first impression; which is followed by that of the darts, and then the venomous liquor is poured in. The sheath sometimes sticks so fast in the wound, that the animal is obliged to leave it behind; by which the bee soon after dies, and the wound is considerably inflamed. It might at first appear well for mankind, if the bee were without its sting: but, upon recollection, it will be found that the little animal would then have too many rivals in sharing its labours. An hundred other lazy animals,

fond of honey, and hating labour, would intrude upon the sweets of the hive; and the treasure would be carried off, for want of armed guardians to protect it.

From examining the bee singly, we now come to consider it in society, as an animal not only subject to laws, but active, vigilant, laborious, and disinterested. All its provisions are laid up for the community; and all its arts in building a cell, designed for the benefit of posterity. The substance with which bees build their cells is wax; which is fashioned into convenient apartments for themselves and their young. When they begin to work in their hives, they divide themselves into four companies: one of which roves in the fields in search of materials; another employs itself in laying out the bottom and partitions of their cells; a third is employed in making the inside smooth from the corners and angles; and the fourth company brings food for the rest, or relieves those who return with their respective burdens. But they are not kept constant to one employment; they often change the tasks assigned them; those that have been at work, being permitted to go abroad, and those that have been in the fields already, take their places. They seem even to have signs, by which they understand each other; for when any of them wants food, it bends down its trunk to the bee from whom it is expected, which then opens its honey-bag, and lets some drops fall into the other's mouth, which is at that time opened to receive it. Their diligence and labour is so great, that, in a day's time, they are able to make cells, which lie upon each other, numerous enough to contain three thousand bees.

If we examine their cells, they will be found formed in the exactest proportion. It was said by Pappus, an ancient geometrician, that, of all figures, hexagons were the most convenient; for, when placed touching each other, the most convenient room would be given, and the smallest lost. The cells of the bees are perfect hexagons: these in every honey-comb are double, opening on either side, and closed at the bottom. The bottoms are composed of little triangular panes, which, when united together, terminate in a point, and lie exactly upon the extremities of other panes of the same shape, in opposite cells. These lodgings have spaces, like streets, between them, large enough to give the bees a free passage in and out; and yet narrow enough to preserve the necessary heat The mouth of every cell is defended by a border, which makes the door a little less than the inside of the cell, which serves to strengthen the whole. These cells serve for different purposes: for laying up their young; for their wax; and for their honey, which makes their principal subsistence.

It is well known that the habitation of bees ought to be very close; and what their hives want, from the negligence or unskilfulness of man, these animals supply by their own industry: so that it is their principal care, when first hived, to stop up all the crannies. For this purpose, they make use of a resinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients called Propolis; it will grow considerably hard in June; though it will in some measure soften by heat; and is often found different in consistence, colour, and smell. It has generally an agreeable aromatic odour when it is warmed; and by some it is considered as a most grateful perfume. When the bees begin to work with it, it is soft, but it acquires a firmer consistence every day; till at length it assumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and some think it is met with on the birch, the willow, and poplar. However it is procured, it is certain that they plaister the inside of their hives with this composition.

If examined through a glass hive, from the hurry the whole swarm is in, the whole at first appears like anarchy and confusion: but the spectator soon finds every animal diligently employed, and following one pursuit, with a settled purpose. Their teeth are the instruments by which they model and fashion their various buildings. and give them such symmetry and perfection. They begin at the top of the hive; and several of them work at a time at the cells which have two faces. If they are stinted with regard to time, they give the new cells but half the depth which they ought to have; leaving them imperfect, till they have sketched out the number of cells necessary for the present occasion. The construction of their combs costs them a great deal of labour: they are made by insensible additions; and not cast at once in a mould. There seems no end of their shaping, finishing, and turning them neatly up. The cells for their young are most carefully formed; those designed for lodging the drones are larger than the rest; and that for the queen-bee the largest of all. Honey is not the only food upon which these animals subsist. The meal of flowers, of which their wax is formed, is one of their most favourite repasts. This is a diet which they live upon during the summer, and of which they lay up a large winter provision. The wax of which their combs are made, is no more than this meal digested, and wrought into a paste. When the flowers upon which the bees generally feed are not fully blown, and this meal or dust is not offered in sufficient quantities, the bees pinch the tops of the stamina in which it is contained with their teeth; and thus anticipate the progress of vegetation. In April and May, the bees are busy, from

morning to evening, in gathering this meal; but when the weather becomes too hot in the midst of summer, they work only in the morning.

The bee is furnished with a stomach for its wax, as well as its honey. In the former of the two, their powder is altered, digested and concocted into real wax; and is thus ejected by the same passage by which it was swallowed. Every comb, newly made is white: but it becomes yellow as it grows old, and almost black when kept too long in the hive. Besides the wax thus digested, there is a large portion of the powder kneaded up for food, in every hive, and kept in separate cells for winter provision. This is called, by the country people, bee-bread; and contributes to the health and strength of the animal during winter. Those who rear bees, may rob them of their honey, and feed them, during the winter with treacle; but no proper substitute has yet been found for the bee-bread; and without it, the animals become consumptive and die.

How numerous soever the multitude of bees may appear in one swarm, they all owe their origin to a single parent which is called the queen-bee. It is indeed surprising that a single insect should in one summer give birth to above twenty thousand young: but, upon opening her body, the wonder will cease; as the number of eggs appearing, at one time, amounts to five thousand. This animal whose existence is of such importancc to her subjects, may easily be distinguished from the rest by her size and the shape of her body. On her safety depends the whole welfare of the commonwealth; and the attentions paid her by all the rest of the swarm evidently shew the dependence her subjects have upon her security. If this insect be carefully observed, she will be seen at times attended with a numerous retinue, marching from cell to cell, plunging the extremity of her body into many of them and leaving a small egg in each.

The bees which generally compose her train, are thought to be males, which serve to impregnate her by turns. These are larger and blacker than the common bees; without stings, and without industry. They seem formed only to transmit a posterity. It must be observed, however. that all this fertility of the queen-bee, and the great attentions paid to her by the rest, are controverted by more recent observers. They assert, that the common bees are parents themselves; that they deposit their eggs in the cells which they have prepared; that the females are impregnated by the males, and bring forth a progeny, which is wholly their own.

The egg is fixed to the bottom of the cell, and touches it but in a single point. A day or two after it is deposited, the

worm is excluded from the shell of the egg, having the appearance of a maggot rolled up in a ring, and lying on a soft bed of a whitish coloured jelly; upon which also the little animal begins to feed. In the mean time, the instant it appears, the working bees attend it with the most anxious and parental tenderness. Thus attended, and plentifully fed, the worm, in less than six days time, comes to its full growth, and no longer accepts the food offered it. When the bees perceive that it has no further occasion for feeding, they perform the last offices of tenderness, and shut the little animal up in its cell; walling up the mouth of its apartment with wax; there they leave the worm to itself; having secured it from every external injury.

The worm is no sooner left enclosed, but, from a state of inaction, it begins to labour, extending and shortening its body; and by this means lining the walls of its apartment with a silken tapestry, which it spins in the manner of caterpillars, before they undergo their last transformation. When their cell is thus prepared, the animal is soon after transformed into an aurelia; but differing from that of the common caterpillar, as it exhibits not only the legs, but the wings of the future bee, in its present state of inactivity. Thus, in about twenty, or one-and-twenty days after the egg is laid, the bee is completely formed, and fitted to undergo the fatigues of its state. When all its parts have acquired their proper strength and consistence, the young animal opens its prison, by piercing with its teeth the waxen door that confines it. When just freed from its cell, it is as yet moist, and incommoded with the spoils of its former situation; but the officious bees are soon seen to flock round it, and to lick it clean on all sides with their trunks; while another band, with equal assiduity, are observed to feed it with honey: others again begin immediately to cleanse the cell that has been just left; to carry the ordures out of the hive, and to fit the place for a new inhabitant. The young bee soon repays their care by its industry; for as soon as ever its external parts become dry, it discovers its natural appetite for labour, and industriously begins the task, which it pursues unremittingly through life. The toil of man is irksome to him, and he earns his subsistence with pain; but this little animal seems happy in its pursuits, and finds delight in all its employments.

When bees first begin to break their prisons, there are generally above an hundred excluded in one day. Thus, in the space of a few weeks, the number of the inhabitants in one hive, of a moderate size, becomes so great, that there is

no place to contain the new comers; and they are scarcely excluded from the cell, when they are obliged, by the old bees, to sally forth in quest of new habitations. In other words the hive begins to swarm, and the new progeny prepares for exile.

While there is room enough in the hive, the bees remain quietly together; it is necessity alone that compels the separation. Sometimes, indeed, the young brood, with graceless obstinacy refuse to depart, and even venture to resist their progenitors. The young ones are known by being browner than the old, with whiter hair; the old ones are of a lighter colour, with red hair. The two armies are therefore easily distinguishable, and dreadful battles are often seen to ensue. But the victory almost ever terminates, with strict poetical justice, in favour of the veterans, and the rebellious offspring are driven off, not without loss and mutilation.

In different countries, the swarms make their appearance at different times of the year, and there are several signs previous to this intended migration. The night before, an unusual buzzing is heard in the hive; in the morning, though the weather be soft and inviting, they seem not to obey the call, being intent on more important meditations within. All labour is discontinued in the hive, every bee is either employed in forcing, or reluctantly yielding a submission; at length, after some noise and tumult, a queen-bee is chosen, to guard, rather than conduct the young colony to other habitations, and then they are marshalled without any apparent conductor. In less than a minute, they leave their native abode, and forming a cloud round their protectress, they set off, without seeming to know the place of their destination; *The world before them, where to choose their place of rest.* The usual time of swarming, is from ten in the morning to three in the afternoon, when the sun shines bright, and invites them to seek their fortunes. They flutter for awhile, in the air, like flakes of snow, and sometimes undertake a distant journey, but more frequently are contented with some neighbouring asylum; the branch of a tree, a chimney top, or some other exposed situation. It sometimes is found, that there are two or three queens to a swarm, and the colony is divided into parties; but it most usually happens, that one of these is more considerable than the other, and the bees, by degrees, desert the weakest, to take shelter under the most powerful protector. The deserted queen does not long survive this defeat: she takes refuge under the new monarch, and is soon destroyed by her jealous rival. Till this cruel execution is performed, the bees never go out to work; and if there should be a queen-bee belonging to the new colony, left in

the old hive, she always undergoes the fate of the former. However, it must be observed, that the bees never sacrifice any of their queens, when the hive is full of wax and honey; for there is at that time, no danger in maintaining a plurality of breeders.

When the swarm is thus conducted to a place of rest, and the policy of government is settled, the bees soon resume their former labours. The making cells, storing them with honey, impregnating the queen, making proper cells for the reception of the rising progeny, and protecting them from external danger, employ their unceasing industry. But soon after, and towards the latter end of summer, when the colony is sufficiently stored with inhabitants, a most cruel policy ensues. The drone bees, which are (as has been said) generally in a hive, to the number of a hundred, are marked for slaughter. These, which had hitherto led a life of indolence and pleasure, whose only employment was in impregnating the queen, and rioting upon the labours of the hive, without aiding in the general toil, now share the fate of most voluptuaries, and fall a sacrifice to the general resentment of society.

When a hive sends out several swarms in the year, the first is always the best, and the most numerous. These having the whole summer before them, have the more time for making wax and honey, and consequently their labours are the most valuable to the proprietor. Although the swarm chiefly consists of the youngest bees, yet it is often found, that bees of all ages compose the multitude of emigrants, and it often happens, that bees of all ages are seen remaining behind. The number of them is always more considerable than that of some populous cities, for sometimes upwards of forty thousand are found in a single hive. So large a body may be well supposed to work with great expedition; and in fact, in less than twenty-four hours, they will make combs above twenty inches long, and seven or eight broad. Sometimes they will half fill their hives with wax in less than five days. In the first fifteen days, they are always found to make more wax than they do afterwards during the rest of the year.

A farm, or a country, may be over-stocked with bees; as with any other sort of animal; for a certain number of hives always require a certain number of flowers to subsist on. When the flowers near home are rifled, then are these industrious insects seen taking more extensive ranges, but their abilities may be over-taxed; and if they are obliged, in quest of honey, to go too far from home, they are over-wearied in the pursuit, they are devoured by birds, or beaten down by the winds and rain.

From a knowledge of this, in some parts of France and Piedmont, they have contrived a kind of floating bee-house. They have on board one barge, threescore or an hundred bee-hives, well defended from the inclemency of an accidental storm; and with these, the owners suffer themselves to float gently down the river. As the bees are continually choosing their flowry pasture along the banks of the stream, they are furnished with sweets before unrifled; and thus a single floating bee-house yields the proprietor a considerable income. Bees gather two kinds of wax, one coarse and the other fine. The coarser sort is bitter, and with this, which is called Propolis, they stop up all the holes and crevices of their hives. It is of a more resinous nature than the fine wax, and is consequently better qualified to resist the moisture of the season, and preserve the works warm and dry within. The fine wax is as necessary to the animal's preservation as the honey itself. With this they make their lodgings, with this they cover the cells of their young, and in this they lay up their magazines of honey.

As of wax, there are also two kinds of honey; the white and the yellow. The white is taken without fire from the honey-combs. The yellow is extracted by heat, and squeezed through bags in a press. The best honey is new, thick, and granulated, of a clear transparent white colour, of a soft and aromatic smell, and of a sweet lively taste. Honey made in mountainous countries is preferable to that of the valley. The honey made in the spring, is more highly esteemed than that gathered in summer, which last is still more valuable than that of autumn, when the flowers begin to fade and lose their fragrance.

The bees are nearly alike in all parts of the world, yet there are differences worthy our notice. In Guadaloupe the bee is less by one half than the European, and more black and round. They have no sting, and make their cells in hollow trees; where, if the hole they meet with is too large, they form a sort of waxen house, of the shape of a pear, and in this they lodge and store their honey, and lay their eggs. They lay up their honey in waxen vessels of the size of a pigeon's egg, of a black or deep violet colour; and these are so joined together, that there is no space left between them. The honey never congeals, but is fluid, of the consistence of oil, and the colour of amber. Resembling these, there are found little black bees, without a sting, in all the tropical climates; and though these countries are replete with bees, like our own, yet these form the most useful and laborious tribe in that part of the world. The honey they produce is neither so unpalatable nor so surfeiting as ours; and the wax

is so soft, that it is only used for medicinal purposes, it being never found hard enough to form into candles, as in Europe.

Of insects that receive the name of bees, among us, there are several; which however differ very widely from that industrious, social race we have been just describing. The *Humble-bee* is the largest of all this tribe, being as large as the first joint of one's middle finger. These are seen in every field, and perched on every flower. They build their nest in holes in the ground, of dry leaves, mixed with wax and wool, defended with moss from the weather. Each humble-bee makes a separate cell, about the size of a small nutmeg, which is round and hollow, containing the honey in a bag. Several of these cells are joined together, in such a manner, that the whole appears like a cluster of grapes. The females, which have the appearance of wasps, are very few, and their eggs are laid in cells, which the rest soon cover over with wax. It is uncertain whether they have a queen or not; but there is one much larger than the rest, without wings, and without hair, and all over black, like polished ebony. This goes and views all the works, from time to time, and enters into the cell, as if it wanted to see whether every thing was done right: in the morning, the young humble-bees are very idle, and seem not at all inclined to labour, till one of the largest, about seven o'clock, thrusts half its body from a hole designed for that purpose, and seated on the top of the nest, beats its wings for twenty minutes successively, buzzing the whole time, till the whole colony is put in motion. The humble-bees gather honey, as well as the common bees; but it is neither so fine, nor so good, nor the wax so clean, or so capable of fusion.

Beside the bees already mentioned, there are various kinds among us, that have much the appearance of honey-makers, and yet make only wax. The *Wood-bee* is seen in every garden. It is rather larger than the common queen-bee; its body of a blueish black, which is smooth and shining. It begins to appear at the approach of spring, and is seen flying near walls exposed to a sunny aspect. This bee makes its nest in some piece of wood, which it contrives to scoop and hollow for its purpose. This, however, is never done in trees that are standing, for the wood it makes choice of is half rotten. The holes are not made directly forward, but turning to one side, and have an opening sufficient to admit one's middle finger; whence runs the inner apartment, generally twelve or fifteen inches long. The instruments used in boring these cavities, are their teeth; the cavity is usually branched into three or four apartments; and in each of these they lay their

eggs, to the number of ten or twelve, each separate and distinct from the rest. The egg is involved in a sort of paste, which serves at once for the young animal's protection and nourishment. The grown bees, however, feed upon small insects, particularly a louse, of a reddish brown colour, of the size of a small pin's head.

Mason-bees make their cells with a sort of mortar made of earth, which they build against a wall that is exposed to the sun. The mortar, which at first is soft, soon becomes as hard as stone, and in this their eggs are laid. Each nest contains seven or eight cells, an egg in every cell, placed regularly one over the other. If the nest remains unhurt, or wants but little repairs, they make use of them the year ensuing; and thus they often serve three or four years successively. From the strength of their houses, one would think these bees in perfect security, yet none are more exposed than they. A worm with very strong teeth is often found to bore into their little fortifications, and devour their young.

The *Ground-bee* builds its nest in the earth, wherein they make round holes, five or six inches deep; the mouth being narrow, and only just sufficient to admit the little inhabitant. It is amusing enough, to observe the patience and assiduity with which they labour. They carry out all the earth, grain by grain, to the mouth of the hole, where it forms a little hillock, an Alps compared to the power of the artist by which it was raised. Sometimes the walks of a garden are found undermined by their labours; some of the holes running directly downward, others horizontally beneath the surface. They lay up in these cavities provisions for their young, which consist of a paste that has the appearance of corn, and is of a sweetish taste.

The *Leaf-cutting Bees* make their nest and lay their eggs among bits of leaves, very artificially placed in holes in the earth, of about the length of a tooth-pick case. They make the bits of leaves of a roundish form, and with them line the inside of their habitations. This tapestry is still further lined by a reddish kind of paste, somewhat sweet or acid. These bees are of various kinds; those that build their nests with chesnut-leaves are as big as drones; but those of the rose-tree are smaller than the common bee.

The *Wall-bees* are so called because they make their nests in walls, of a kind of silky membrane with which they fill up the vacuities between the small stones which form the sides of their habitation. Their apartment consists of several cells, placed end to end, each in the shape of a woman's thimble. Though the web which lines this habitation is thick and warm, yet it is transparent and of a whitish colour. This substance

is supposed to be spun from the animal's body; the males and females are of a size, but the former are without a sting. To these varieties of the bee kind might be added several others which are all different in nature, but not sufficiently distinguished to excite curiosity.

THE WASP is well known to be a winged insect with a sting; to be longer in proportion to its bulk than the bee; to be marked with bright yellow circles round its body, and to be the most swift and active insect of all the fly kind. On each side of the mouth this animal is furnished with a long tooth notched like a saw, and with these it is enabled to cut any substance, not omitting meat itself, and to carry it to its nest. Wasps live like bees in community, and sometimes ten or twelve thousand are found inhabiting a single nest.

Of all insects the wasp is the most fierce, voracious, and most dangerous, when enraged. They are seen wherever flesh is cutting up, gorging themselves with the spoil, and then flying to their nests with their reeking prey. They make war also on every other fly, and the spider himself dreads their approaches.

Every community among bees is composed of females or queens, drones or males, and neutral or working bees. Wasps have similar occupations; the two first are for propagating the species, the last for nursing, defending, and supporting the rising progeny. Among bees, however, there is seldom above a queen or two in a hive; among wasps there are above two or three hundred.

As soon as the summer begins to invigorate the insect tribes, the wasps are the most of the number, and are diligently employed either in providing provisions for their nest, if already made, or in making one, if the former habitation be too small to receive the increasing community. The nest is one of the most curious objects in Natural History, and contrived almost as artificially as that of the bees themselves. Their principal care is to seek out a hole that has been begun by some other animal, a field mouse, a rat or a mole, to build their nests in. They sometimes build upon the plain, where they are sure of the dryness of their situation; but most commonly on the side of a bank, to avoid the rain or water that would otherwise annoy them. When they have chosen a proper place, they go to work with wonderful assiduity. Their first labour is to enlarge and widen the hole, taking away the earth, and carrying it off to some distance. To prevent the earth from falling down and crushing their rising city into ruin, they make a sort of roof with their gluey

substance, to which they begin to fix the rudiments of their building, working from the top downwards, as if they were hanging a bell, which, however, at length, they close up at the bottom. The materials with which they build their nests, are bits of wood and glue. The wood they get where they can, from the rails and posts which they meet with in the fields and elsewhere. These they saw and divide into a multitude of small fibres, of which they take up little bundles in their claws, letting fall upon them a few drops of gluey matter with which their bodies are provided, by the help of which they knead the whole composition into a paste, which serves them in their future building. When they have returned with this to the nest, they stick their load of paste on that part where they make their walls and partitions; they tread it close with their feet, and trowel it with their trunks, still going backwards as they work. Having repeated this operation three or four times, the composition is at length flatted out until it becomes a small leaf of a grey colour, much finer than paper, and of a pretty firm texture. This done, the same wasp returns to the field to collect a second load of paste, repeating the same several times, placing layer upon layer, and strengthening every partition in proportion to the wants or convenience of the general fabric. Other working wasps come quickly after to repeat the same operation, laying more leaves upon the former, till at length, after much toil, they have finished the large roof which is to secure them from the tumbling in of the earth. This dome being finished, they make another entrance to their habitation, designed either for letting in the warmth of the sun, or for escaping, in case one door be invaded by plunderers. Certain, however, it is, that by one of these they always enter, by the other they sally forth to their toil; each hole being so small that they can pass but one at a time. The walls being thus composed, and the whole somewhat of the shape of a pear, they labour at their cells, which they compose of the same paper-like substance that goes to the formation of the outside works. Their combs differ from those of bees, not less in the composition than the position which they are always seen to obtain. The honey-comb of the bee is edgeways with respect to the hive; that of the wasp is flat, and the mouth of every cell opens downwards. Thus is their habitation, contrived story above story, supported by several rows of pillars which give firmness to the whole building, while the upper story is flat-roofed, and as smooth as the pavement of a room, laid with squares of marble. The wasps can freely walk upon these stories between the pillars to do whatever their wants require. The pillars are very hard and

compact, being larger at each end than in the middle, not much unlike the columns of a building. All the cells of the nests are only destined for the reception of the young, being replete with neither wax nor honey.

Each cell is, like that of the bee, hexagonal; but there are two sorts, the one larger, for the production of the male and the female wasps, the other less, for the reception of the working part of the community. When the females are impregnated by the males, they lay their eggs, one in each cell, and stick it in with a kind of gummy matter to prevent its falling out. From this egg proceeds the insect in its worm-state, of which the old ones are extremely careful. But the wasp community differs from that of the bee in this; that among the latter the working bees take the parental duties upon them, whereas, among the wasps the females alone are permitted to feed their young, and to nurse their rising progeny. For this purpose the female waits with great patience till the working wasps have brought in their provisions, which she takes from them, and cuts into pieces. She then goes with great composure from cell to cell, and feeds every young one with her mouth. When the young worms have come to a certain size, they leave off eating, and begin to spin a very fine silk, fixing the first end to the entrance of the cell; then turning their heads, first on one side then on the other, they fix the thread to different parts, and thus they make a sort of door which serves to close up the mouth of the cell. After this they divest themselves of their skins after the usual mode of transformation, the aurelia by degrees begins to emancipate itself from its shell; by little and little it thrusts out its legs and wings, and insensibly acquires the colour and shape of its parent.

The wasp thus formed, and prepared for depredation, becomes a bold, troublesome, and dangerous insect; there are no dangers which it will not encounter in pursuit of its prey, and nothing seems to satiate its gluttony. Though it can gather no honey of its own, no animal is more fond of sweets. For this purpose, it will pursue the bee and the humble-bee, destroy them with its sting, and then plunder them of their honey-bag, with which it flies triumphantly loaded to its nest to regale its young. Wasps are ever fond of making their nests in the neighbourhood of bees, merely to have an opportunity of robbing their hives, and feasting on the spoil. Yet the bees are not found always patiently submissive to their tyranny, but fierce battles are sometimes seen to ensue, in which the bees make up by conduct and numbers what they want in personal prowess. When there is no honey to be

had, they seek for the best and sweetest fruits, and they are never mistaken in their choice. From the garden they fly to the city, to the grocers' shops, and butchers' shambles. They will sometimes carry off bits of flesh half as big as themselves, with which they fly to their nest for the nourishment of their brood. Those who cannot drive them away, lay for them a piece of ox's liver, which being without fibres, they prefer to other flesh; and wherever they are found, all other flies are seen to desert the place immediately. Such is the dread with which these little animals impress all the rest of the insect tribes, which they seize and devour without mercy, that they vanish at their approach. Wherever they fly, like the eagle or the falcon, they form a desert in the air around them. In this manner the summer is passed in plundering the neighbourhood, and rearing up their young; every day adds to their numbers; and from their strength, agility, and indiscriminate appetite for every kind of provision, were they as long lived as the bee, they would soon swarm upon the face of nature, and become the most noxious plague of man: but providentially their lives are measured to their mischief, and they live but a single season. In proportion as the cold of the winter increases, they are seen to become more domestic; they seldom leave the nest, they make but short adventures from home, they flutter about in the noon-day heats, and soon after return chilled and feeble.

As their calamities increase, new passions soon begin to take place; the care for posterity no longer continues, and as the parents are no longer able to provide their growing progeny a supply, they take the barbarous resolution of sacrificing them all to the necessity of the times. In this manner, like a garrison upon short allowance, all useless hands are destroyed; the young worms, which a little before they fed and protected with so much assiduity, are now butchered and dragged from their cells. As the cold increases they no longer find sufficient warmth in their nests, which grow hateful to them, and they fly to seek it in the corners of houses, and places that receive an artificial heat. But the winter is still insupportable; and, before the new year begins, they wither and die; the working wasps first, the males soon following, and many of the females suffering in the general calamity. In every nest, however, one or two females survive the winter, and having been impregnated by the male during the preceding season, she begins in spring to lay her eggs in a little hole of her own contrivance. This bundle of eggs, which is clustered together like grapes, soon produces two worms which the female takes proper

precaution to defend and supply, and these when hatched soon give assistance to the female, who is employed in hatching two more; these also gathering strength, extricate themselves out of the web that incloses them; and become likewise assistants to their mother: fifteen days after, two more make their appearance, thus is the community every day increasing, while the female lays in every cell, first a male and then a female. These soon after become breeders in turn, till, from a single female, ten thousand wasps are seen produced before the month of June.

The *Hornet* is one of the largest and most remarkable species of the wasp. It is twice as large as the common wasp, and is also distinguished by a black breast, and double black spots on the belly; the head is also longer and slenderer, and the eyes somewhat resembling a half moon. It is extremely bold and venomous. Its predominant passion is for flesh, and when hungry two or three of them will seize upon a small bird, kill it and devour its flesh.—Nay, it has even been said, that singly, it will attack and conquer a sparrow. In all its manners and habits, it entirely resembles the wasps we have been describing.

Such is the history of the social wasp; but, as among bees, so also among these insects, there are various tribes that live in solitude: these lay their eggs in a hole for the purpose, and the parent dies long before the birth of its offspring. In the principal species of the *Solitary Wasps*, the insect is smaller than the working wasp of the social kind. The filament, by which the corslet is joined to the body, is longer and more distinctly seen, and the whole colour of the insect is blacker than in the ordinary kinds. But it is not the figure, but the manners of this extraordinary insect that claim our principal regard.

From the end of May to the beginning of July, this wasp is seen most diligently employed. The whole purpose of its life seems to be in contriving and fitting up a commodious apartment for its young one, which is not to succeed it till the year ensuing. For this end, it is employed, with unwearied assiduity, in boring a hole into the finest earth some inches deep, but not much wider than the diameter of its own body. This is but a gallery leading to a wider apartment destined for the convenient lodgment of its young. As it always chooses a gravelly soil to work in, and where the earth is almost as hard as stone itself, the digging and hollowing this apartment is an enterprise of no small labour; for effecting its operations, this insect is furnished with two teeth, which are strong and firm, but not sufficiently hard to

penetrate the substance through which it is resolved to make its way: in order therefore to soften that earth which it is unable to pierce, it is furnished with a gummy liquor which it emits upon the place, and which renders it more easily separable from the rest, and the whole becoming a kind of soft paste, is removed to the mouth of the habitation. The animal's provision of liquor in these operations is however soon exhausted; and it is then seen taking up water from some neighbouring flower or stream, in order to supply the deficiency.

At length after much toil, a hole some inches deep is formed, at the bottom of which is a large cavity; and to this no other hostile insect would venture to find its way, from the length and the narrowness of the defile through which it would be obliged to pass. In this the solitary wasp lays its egg, which is destined to continue the species; there the nascent animal is to continue for above nine months, unattended and immured, and at first appearance the most helpless insect of the creation. But when we come to examine, new wonders offer; no other insect can boast so copiously luxuriant a provision, or such confirmed security.

As soon as the mother-wasp has deposited her egg at the bottom of the hole, her next care is to furnish it with a supply of provisions, which may be offered to the young insect as soon as it leaves the egg. To this end, she procures a number of little green worms, generally from eight to twelve and these are to serve as food for the young one the instant it awakens into life. When this supply is regularly arranged and laid in, the old one, then with as much assiduity as it before worked out its hole, now closes the mouth of the passage; and thus leaving its young one immured in perfect security, and with a copious supply of animal food, dies, satisfied with having provided for a future progeny.

When the young one leaves the egg it is scarcely visible, and is seen immured among a number of insects, infinitely larger than itself, ranged in proper order around it, which, however, give it no manner of apprehension. Whether the parent, when she has laid in the insect provision, contrived to disable the worms from resistance, or whether they were at first incapable of any is not known. Certain it is, that the young glutton feasts upon the living spoil without any control; his game lies at his hand, and he devours one after the other as the calls of appetite incite him. The life of the young animal is therefore spent in the most luxurious manner, till its whole stock of worms is exhausted, and the time

of its transformation begins to approach; and then spinning a silken web, it continues fixed in its cell till the sun calls it from its dark abode the ensuing summer.

The wasps of Europe are very mischievous, yet they are innocence itself when compared to those of the tropical climates, where all the insect tribes are not only numerous, but large, voracious, and formidable. Those of the West Indies are thicker, and twice as long as the common bee; they are of a grey colour, striped with yellow, and armed with a very dangerous sting. They make their cells in the manner of a honey-comb, in which the young ones are hatched and bred. They generally hang their nests by threads, composed of the same substance with the cells, to the branches of trees, and the eaves of houses. They are seen every where in great abundance, descending like fruit, particularly pears, of which shape they are, and as large as one's head. The inside is divided into three round stories, full of cells, each hexagonal, like those of an honey-comb. In some of the islands, these insects are so very numerous, that their nests are stuck up in this manner, scarce two feet asunder, and the inhabitants are in continual apprehension from their accidental resentment. It sometimes happens, that no precaution can prevent their attacks, and the pain of their sting is almost insupportable. Those who have felt it think it more terrible than even that of a scorpion; the whole visage swells, and the features are so disfigured, that a person is scarcely known by his most intimate acquaintance.

THE ICHNEUMON FLY. Every rank of insects, how voracious soever, have enemies that are terrible to them, and that revenge upon them the injuries done upon the rest of the animated creation. The wasp, as we have seen, is very troublesome to man, and very formidable to the insect tribe; but the ichneumon fly (of which there are many varieties) fears not the wasp itself: it enters its retreats, plunders its habitations, and takes possession of that cell for its own young, which the wasp had laboriously built for a dearer posterity.

This fly receives its name from the little quadruped, which is found to be so destructive to the crocodile; as it bears a strong similitude to its courage and rapacity; but though there are many different kinds of this insect, yet the most formidable, and that best known, is called the common ichneumon, with four wings, like the bee, a long slender black body, and a three forked tail, consisting of bristles; the two outermost black, and the middlemost red.

Though this instrument is to all appearance slender and feeble, yet it is found to be a weapon of great force and efficacy. There is scarcely any substance which it will not pierce; and, indeed, it is seldom seen but employed in penetration. The male is unprovided with such a sting, while the female uses it with great force and dexterity, brandishing it when caught, from side to side, and very often wounding those who thought they held her with the greatest security.

All the flies of this tribe are produced in the same manner, and owe their birth to the destruction of some other insect, within whose body they have been deposited, and upon whose vitals they have preyed, till they came to maturity. There is no insect whatever which they will not attack, in order to leave their fatal present in its body; the caterpillar, the gnat, and even the spider himself, so formidable to others, is often made the unwilling fosterer of their destructive progeny.

About the middle of summer, when other insects are found in great abundance, the ichneumon is seen flying busily about, and seeking proper objects upon whom to deposit its progeny. As there are various kinds of this fly, so they seem to have various appetites. Some are found to place their eggs within the aurelia of some nascent insect, others place them within the nest which the wasp had curiously contrived for its own young; and as both are produced at the same time, the young of the inchneumon not only devours the young wasp, but the whole supply of worms, which the parent had carefully provided for its provision. But the greatest number of the ichneumon tribe are seen settling upon the back of the caterpillar, and darting at different intervals, their stings into its body. It often happens, that the caterpillar survives the worm state of the infant ichneumon, and then they change into a chrysalis, enclosed in its body till the time of their delivery approaches, when they burst their prisons, and fly away. The caterpillar, however, is irreparably destroyed, it never changes into a chrysalis, but dies shortly after from the injuries it had sustained.

THE ANT. Though the number of two-winged flies be very great, and the naturalists have taken some pains to describe their characters and varieties; yet there is such a similitude in their forms and manners, that in a work like this, one description must serve for all. We now, therefore, come to a species of four-winged insects, that are famous from all antiquity for their social and industrious habits, that are

marked for their spirit of subordination, that are offered as a pattern of parsimony to the profuse, and of unremitting diligence to the sluggard.

By the experiments, however, which have been more recently made, and the observations which have been taken, much of their boasted frugality and precaution seems denied them: the treasures they lay up, are no longer supposed intended for future provision; and the choice they make in their stores, seems no way dictated by wisdom. It is, indeed, somewhat surprising, that almost every writer of antiquity should describe this insect, as labouring in the summer, and feasting upon the produce during the winter. Perhaps, in some of the warmer climates, where the winter is mild, and of short continuance, this may take place; but in France and England these animals can have no manner of occasion for a supply of winter provision, as they are actually in a state of torpidity during that season.

The common ants of Europe are of two or three different kinds; some *red*, some *black*, some with stings, and others without. Such as have stings, inflict their wounds in that manner; such as are unprovided with these weapons of defence, have a power of spurting, from their hinder parts, an acid pungent liquor, which, if it lights upon the skin, inflames and burns it like nettles.

The body of an ant is divided into the head, breast, and belly. In the head the eyes are placed, which are entirely black, and under the eyes there are two small horns, or feelers, composed of twelve joints, all covered with a fine silky hair. The mouth is furnished with two crooked jaws, which project outwards, in each of which are seen incisors, that look like teeth. The breast is covered with a fine silky hair, from which project six legs, that are pretty strong and hairy, the extremities of each armed with two small claws, which the animal uses in climbing. The belly is more reddish than the rest of the body, which is of a brown chesnut colour, shining as a glass, and covered with extremely fine hair.

From such a formation, this animal seems bolder, and more active for its size, than any other of the insect tribe, and fears not to attack a creature often above ten times its own magnitude.

As soon as the winter is past on the first fine day in April, the ant hill, that before seemed a desert, now swarms with new life, and myriads of these insects are seen just awaked from their annual lethargy, and preparing for the pleasures and fatigues of the season. For the first day they never offer

to leave the hill, which may be considered as their citadel, but run over every part of it, as if to examine its present situation, to observe what injuries it has sustained during the rigours of winter,* while they slept, and to meditate and settle the labours of the day ensuing.

At the first display of their forces, none but the wingless tribe appears, while those furnished with wings remain at the bottom. These are the working ants, that first appear, and that are always destitute of wings; the males and females, that are furnished with four large wings each, are more slow in making their appearance.

Thus, like bees, they are divided into males and females, and the neutral or working tribe. These are all easily distinguished from each other; the females are much larger than the males; the working ants are the smallest of all. The two former have wings; which, however, they sometimes are divested of; the latter never have any, and upon them are devolved all the labours that tend to the welfare of the community. The female, also, may be distinguished by the colour and structure of her breast, which is a little more brown than that of the common ant, and a little brighter than that of the male.

In the fields of England, ant-hills are formed with but little apparent regularity. In the more southern provinces of Europe, they are constructed with wonderful contrivance, and offer a sight highly worthy a naturalist's curiosity. These are generally formed in the neighbourhood of some large tree and a stream of water. The one is considered by the animals as the proper place for getting food, the other for supplying them with moisture, which they cannot well dispense with. The shape of the ant-hill is that of a sugar-loaf, about three feet high; composed of various substances; leaves, bits of wood, sand, earth, bits of gum, and grains of corn. These are all united into a compact body, perforated with galleries down to the bottom, and winding ways within the body of the structure. From this retreat to the water, as well as to the tree, in different directions, there are many paths worn by constant assiduity, and along these the busy insects are seen passing and repassing continually; so that from May, or the beginning of June, according to the state of the season, they work continually, till the cold weather comes on.

The chief employment of the working arts, is in sustaining, not only the idlers at home, but also finding a sufficiency of food for themselves. They live upon various provisions,

* Memoires pour servir a l' Histoire des Insectes, par Charles de Geer.

as well of the vegetable as of the animal kind. Small insects they will kill and devour; sweets of all kinds they are particularly fond of. They seldom, however, think of their community, till they themselves are first satiated. Having found a juicy fruit, they swallow what they can, and then tearing it in pieces, carry home their load. If they meet with an insect above their match, several of them will fall upon it at once, and having mangled it, each will carry off a part of the spoil. If they meet, in their excursion, any thing that is too heavy for one to bear, and yet, which they are unable to divide, several of them will endeavour to force it along; some dragging and others pushing. If any one of them happens to make a lucky discovery, it will immediately give advice to others; and then, at once the whole republic will put themselves in motion. If in these struggles, one of them happens to be killed, some kind survivor will carry him off to a great distance, to prevent the obstruction his body may give to the general spirit of industry.

But while they are thus employed in supporting the state, in feeding abroad, and carrying in provisions to those that continue at home, they are not unmindful of posterity. After a few days of fine weather, the female ants begin to lay their eggs, and those are as assiduously watched and protected by the working ants, who take upon themselves to supply whatever is wanting to the nascent animal's convenience or necessity. They are carried, as soon as laid, to the safest situation, at the bottom of their hill, where they are carefully defended from cold and moisture. We are not to suppose that those white substances which we so plentifully find in every ant-hill, are the eggs as newly laid. On the contrary, the ant's egg is so very small, that though laid upon a black ground, it can scarcely be discerned. The little white bodies we see, are the young animals in their maggot state, endued with life, long since freed from the egg, and often involved in a cone, which it has spun round itself, like the silkworm. The real egg, when laid, if viewed through a microscope, appears smooth, polished and shining, while the maggot is seen composed of twelve rings, and is often larger than the ant itself.

It is impossible to express the fond attachment which the working ants shew to their rising progeny. In cold weather they take them in their mouths, but without offering them the smallest injury, to the very depths of their habitation, where they are less subject to the severity of the season. In a fine day they remove them, with the same care, nearer the surface, where their maturity may be assisted by the warm beams of

the sun. If a formidable enemy should come to batter down their whole habitation, and crush them by thousands in the ruin, yet these wonderful insects, still mindful of their parental duties, make it their first care to save their offspring. They are seen running wildly about, and indifferent ways, each loaded with a young one, often bigger than the insect that supports it. "I have kept," says Swammerdam, "several of the working ants in my closet, with their young in a glass filled with earth. I took pleasure in observing, that in proportion as the earth dried on the surface, they dug deeper and deeper to deposit their eggs; and when I poured water thereon, it was surprising to see with what care, affection and diligence they laboured, to put their brood in safety, in the driest place. I have seen also, that when water has been wanting for several days, and when the earth was moistened after it a little, they immediately carried their young ones to have a share, who seemed to enjoy and suck the moisture.

When the young maggot is come to its full growth, the breast swells insensibly, it casts its skin, and loses all motion. All the members which were hidden before, then begin to appear, an aurelia is formed, which represents very distinctly all the parts of the animal, though they are yet without motion, and, as it were wrapped up in swaddling clothes. When at length the little insect has passed through all its changes, and acquired all its proper maturity, it bursts this last skin, to assume the form it is to retain ever after. Yet this is not done by the efforts of the little animal alone, for the old ones very assiduously break open with their teeth the covering in which it is enclosed. Without this assistance, the aurelia would never be able to get free, as Mr. De Geer often found, who tried the experiment, by leaving the aurelia to themselves. The old ones not only assist them, but know the very precise time for lending their assistance; for, if produced too soon, the young one dies of cold; if retarded too long, it is suffocated in its prison.

When the female has done laying, and the whole brood is thus produced, her labours, as well as that of the male, become unnecessary; and her wings, which she had but a short time before so actively employed, drop off. What becomes of her when thus divested of her ornaments is not well known, for she is seen in the cells for some weeks after. The males, on the other hand, having no longer any occupation at home, make use of those wings with which they have been furnished by nature, and fly away, never to return, or to be heard of more. It is probable they perish

with the cold, or are devoured by the birds, which are particularly fond of this pretty prey.

In the mean time, the working ants, having probably deposed their queens, and being deserted by the males, that served but to clog the community, prepare for the severity of the winter, and bury their retreats as deep in the earth as they conveniently can. It is now found, that the grains of corn, and other substances with which they furnish their hill, are only meant as fences to keep off the rigours of the weather, not as provisions to support them during its continuance. It is found generally to obtain, every insect that lives a year after it is come to its full growth, is obliged to stop four or five months without taking any nourishment, and will seem to be dead all that time. It will be to no purpose, therefore, for ants to lay up corn for the winter, since they lie that time without motion, heaped upon each other, and are so far from eating, that they are utterly unable to stir. Thus, what authors have dignified by the name of a magazine, appears to be no more than a cavity, which serves for a common retreat when the weather forces them to return to their lethargic state.

What has been said with exaggeration of the European ant, is, however true, if asserted of those of the tropical climates. They build an ant-hill with great contrivance and regularity, they lay up provisions, and, as they probably live the whole year, they submit themselves to regulations entirely unknown among the ants of Europe.

Those of Africa are of three kinds, the *white*, the *green*, and the *black;* the latter are above an inch long, and in every respect a most formidable insect. Their sting produces extreme pain, and their depredations are sometimes extremely destructive. They build an ant-hill of a very great size, from six to twelve feet high; it is made of viscous clay, and tapers into a pyramid form. This habitation is constructed with great artifice; and the cells are so numerous and even, that a honey-comb scarcel yexceeds them in number and regularity.

The inhabitants of this edifice seem to be under a very strict regulation. At the slightest warning they will sally out upon whatever disturbs them; and if they have time to arrest their enemy, he is sure to find no money. Sheep, hens, and even rats, are often destroyed by these merciless insects, and their flesh devoured to the bone. No anatomist in the world can strip a skeleton so clean as they; and no animals how strong soever, when they have once seized upon it, has power to resist them.

It often happens that these insects quit their retreat in a body, and go in quest of adventures.

"During my stay," says Smith, "at Cape Corfe Castle, a body of these ants came to pay us a visit in our fortification. It was about day-break when the advanced guard of this famished crew entered the chapel, where some negro servants were asleep upon the floor. The men were quickly alarmed at the invasion of this unexpected army, and prepared, as well as they could, for a defence. When the foremost battalion of insects had already taken possession of the place, the rear-guard was more than a quarter of a mile distant. The whole ground seemed alive, and crawling with unceasing destruction. After deliberating a few moments upon what was to be done, it was resolved to lay a large train of gunpowder along the path they had taken: by this means millions were blown to pieces, and the rear-guard perceiving the destruction of their leaders, thought proper instantly to return, and make back to their original habitation."

The order which these ants observe, seems very extraordinary; whenever they sally forth, fifty or sixty larger than the rest are seen to head the band, and conduct them to their destined prey. If they have a fixed spot where their prey continues to resort, they then form a vaulted gallery, which is sometimes a quarter of a mile in length; and yet they will hollow it out in the space of ten or twelve hours.

Of the Beetle there are various kinds; all, however, concurring in one common formation of having cases to their wings, which are the more necessary to those insects, as they often live under the surface of the earth, in holes which they dig out by their own industry. These cases prevent the various injuries their real wings might sustain, by rubbing or crushing against the sides of their abode. These, though they do not assist in flight, yet keep the internal wings clean and even, and produce a loud buzzing noise, when the animal rises in the air.

If we examine the formation of all animals of the beetle kind, we shall find, as in shell-fish, that their bones are placed externally, and their muscles within. These muscles are formed very much like those of quadrupeds, and are endued with such surprising strength, that, bulk for bulk, they are a thousand times stronger that those of a man. The strength of these muscles is of use in digging the animal's subterraneous abode, where it is most usually hatched, and to which it most frequently returns, even after it becomes a winged insect, capable of flying.

Besides the difference which results from the shape and

colour of these animals, the size also makes a considerable one; some beetles being not larger than the head of a pin, while others, such as the elephant beetle, are as big as one's fist: but the greatest difference among them is, that some are produced in a month, and in a single season go through all the stages of their existence, while others take near four years to their production, and live as winged insects a year more. To give the history of all these animals, that are bred pretty much in the same way, would be insipid and endless; it will suffice to select one or two from the number, the origin of which may serve as specimens of the rest. We will therefore offer the history of the may-bug to the reader's attention; premising, that most other beetles, though not so long lived, are bred in the same manner.

The *may-bug*, or doree-beetle, as some call it, has like all the rest, a pair of cases to its wings, which are of a reddish brown colour, sprinkled with a whitish dust, which easily comes off. In some years their necks are seen covered with a red plate, and in others with a black; these, however, are distinct sorts, and their difference is by no means accidental. The fore-legs are very short, and the better calculated for burrowing in the ground, where this insect makes its retreat. It is well known to children by its evening buz; but still more formidably introduced to the acquaintance of husbandmen and gardeners; for in some seasons it has been found to swarm in such numbers, as to eat up every vegetable production.

The two sexes in the may-bug, are easily distinguished from each other, by the superior length of the tufts, at the end of the horns, in the male.

In about three months after the eggs have been deposited in the earth, the contained insect begins to break its shell, and a small grub or maggot crawls forth, and feeds upon the roots of whatever vegetable it happens to be nearest. All substances of this kind seem equally grateful; yet it is probable the mother insect has a choice among what kind of vegetables she shall deposit her young. In this manner, these voracious creatures continue in the worm state for more than three years, devouring the roots of every plant they approach, and making their way under ground in quest of food with great dispatch and facility. At length they grow to above the size of a walnut, being a great thick white maggot with a red head, which is seen most frequently in new turned earth, and which is so eagerly sought after by birds of every species.

When largest, they are found an inch and an half long, of a whitish yellow colour, with a body consisting of twelve segments or joints, on each side of which there are nine breathing holes, and three red feet. The head is large, in proportion to the body, of a reddish colour, with a pincer before, and a semi-circular lip, with which it cuts the roots of plants, and sucks out their moisture. As this insect lives entirely under ground, it has no occasion for eyes, and accordingly it is found to have none; but is furnished with two feelers, which like the crutch of a blind man, serve to direct its motions. Such is the form of this animal, that lives for years in the worm state under ground, still voracious, and every year changing its skin.

It is not till the end of the fourth year, that this extraordinary insect prepares to emerge from its subterraneous abode, and even this is not effected, but by a tedious preparation.

About the latter end of autumn, the grub begins to perceive the approach of its transformation : it then buries itself deeper and deeper in the earth, sometimes six feet beneath the surface, and there forms itself a capacious apartment, the walls of which it renders very smooth and shining by the excretions of its body. Its abode being thus formed, it begins soon after to shorten itself, to swell, and to burst its last skin, in order to assume the form of a chrysalis. This in the beginning appears of a yellowish colour, which heightens by decrees, till at last it is seen nearly red. Its exterior form plainly discovers all the vestiges of the future winged insect, all the fore parts being distinctly seen; while behind, the animal seems as if wrapped in swaddling clothes.

The young may-bug continues in this state for about three months longer, and as it is not till the beginning of January that the aurelia divests itself of all its impediments, and becomes a winged insect, completely formed; yet still the animal is far from attaining its natural strength, health and appetite. It undergoes a kind of infant imbecility; and, unlike most other insects, that the instant they become flies, are arrived at their state of full perfection, the may-bug continues feeble and sickly.

Its colour is much brighter than in the perfect animal; all its parts are soft, and its voracious nature seems, for awhile, to have entirely forsaken it.

About the latter end of May, these insects, after having lived for four years under ground, burst from the earth, when the first mild evening invites them abroad. They are at that time seen rising from their long imprisonment. from living

long only upon roots, and imbibing only the moisture of the earth, to visit the mildness of the summer air, to choose the sweetest vegetables for their banquet, and to drink the dew of the evening.

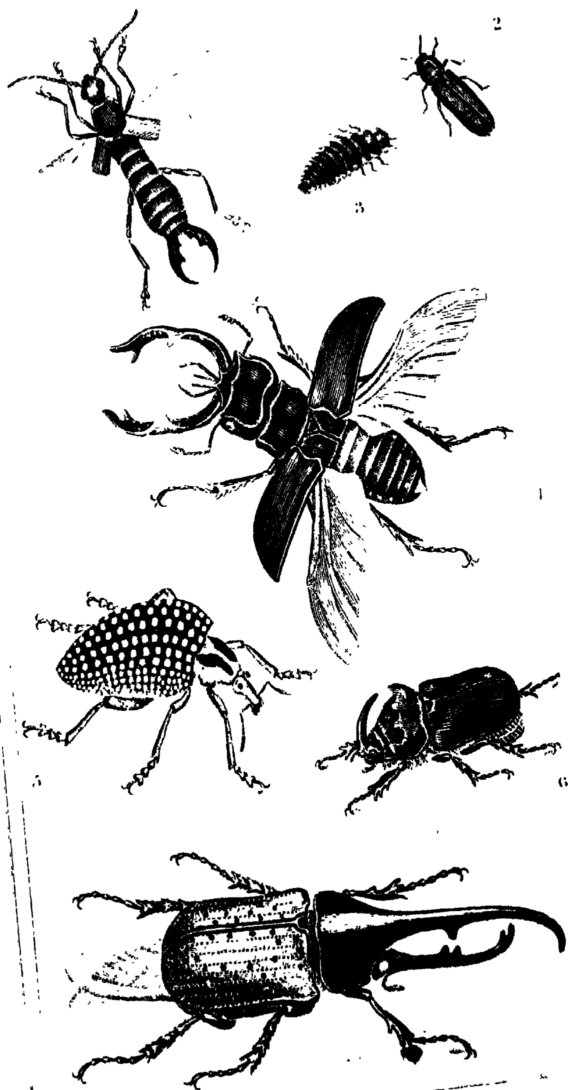
Wherever an attentive observer then walks abroad, he will see them bursting up before him in his pathway, like ghosts on a theatre. He will see every part of the earth, that had its surface beaten into hardness, perforated by their egression. When the season is favourable for them, they are seen by thousands, buzzing along, hitting against every object that intercepts their flight. The mid-day sun, however, seems too powerful for their constitutions; they then lurk under the leaves and branches of some shady tree; but the willow seems particularly their most favourite food; there they lurk in clusters, and seldom quit the tree till they have devoured all its verdure.

Their duration, however, is but short, as they never survive the season.

Of all the beetle kind, this is the most numerous, and therefore deserves the chief attention of history. Like them, all other beetles are bred from the egg, which is deposited in the ground, or sometimes, though seldom, in the barks of trees; they change into a worm; they subsist in that state by living upon the roots of vegetables, or the succulent parts of the bark around them.

It would be endless to give a description of all, and yet it would be an unpardonable omission not to mention the particularities of some beetles, which are singular either from their size, their manners, or their formation.

That beetle which the Americans call the *tumble-dung*, particularly demands our attention; it is all over of a dusky black, rounder than those animals are generally found to be, and so strong, though not much larger than the common black beetle, that if one of them be put under a brass candlestick, it will cause it to move backwards and forwards, as if it were by an invisible hand, to the admiration of those who are not accustomed to the sight; but this strength is given it for much more useful purposes than those of exciting human curiosity, for there is no creature more laborious, either in seeking subsistence, or in providing a proper retreat for its young. They are endowed with sagacity to discover subsistence by their excellent smelling, which directs them in flights to excrements just fallen from man or beast, on which they instantly drop, and fall unanimously to work in forming round balls or pellets thereof, in the middle of which they lay an egg. These pellets in September, they convey three feet deep in the



1. Earwig _ 2 & 3. Male & Female Glow Worm 4. Stag Beetle _ 5. Diamond Beetle 6. Rhinoceros Beetle 7. Hercules Beetle

earth, where they lie till the approach of spring; when the eggs are hatched, the nest bursts, and the insects find their way out of the earth. They assist each other, with indefatigable industry, in rolling these globular pellets to the place where they are to be buried. This they are to perform with the tail foremost, by raising up their hinder part, and shoving along the ball with their hind feet. They are always accompanied with other beetles of a larger size, and of a more elegant structure and colour. The breast of this is covered with a shield of a crimson colour, and shining like metal; the head is of the like colour mixed with green, and on the crown of the head stands a shining black horn, bended backwards. These are called the *kings of the beetles;* but for what reason is uncertain, since they partake of the same dirty drudgery with the rest.

The *elephant-beetle* is the largest of this kind hitherto known, and is found in South America, particularly Guiana and Surinam, as well as about the river Oroonoko. It is of a black colour, and the whole body is covered with a very hard shell, full as thick and as strong as that of a small crab. Its length, from the hinder part of the eyes, is almost four inches, and from the same part to the end of the proboscis, or trunk, four inches and three quarters. The transverse diameter of the body is two inches and a quarter, and the breadth of each elytron, or case for the wings, is an inch and three-tenths. The antennæ, or feelers, are quite horny; for which reason the proboscis, or trunk, is moveable at its insertion into the head, and seems to supply the place of feelers. The horns are eight-tenths of an inch long, and terminate in points. The proboscis is an inch and a quarter long, and turns upwards, making a crooked line, terminating in two horns, each of which is near a quarter of an inch long; but they are not perforated at the end like the proboscis of other insects. About four tenths of an inch above the head, on that side next the body, is a prominence, or small horn, which, if the rest of the trunk were away, would cause this part to resemble the horn of a rhinoceros. There is indeed a beetle so called, but then the horns or trunk has no fork at the end, though the lower horns resemble this. The feet are all forked at the end, but not like the lobster's claws.

To this class we may also refer the *glow-worm,* that little animal which makes such a distinguished figure in the description of our poets. No two insects can differ more than the male and female of this species from each other. The male is in every respect a beetle, having cases to its wings, and rising in the air at pleasure; the female, on the contrary,

has none, but is entirely a creeping insect, and is obliged to wait the approaches of her capricious companion. The body of the female has eleven joints, with a shield breast-plate, the shape of which is oval; the head is placed over this, and is very small, and the three last joints of her body are of a yellowish colour; but what distinguishes it from all other animals, at least in this part of the world, is the shining light which it emits by night, and which is supposed by some philosophers to be an emanation which she sends forth to allure the male to her company.

Most travellers, who have gone through sandy countries, must well remember the little shining sparks with which the ditches are studded on each side of the road. If incited by curiosity to approach more nearly, he will find the light sent forth by the glow-worm; if he should keep the little animal for some time, its light continues to grow paler, and at last appears totally extinct.

The *cantharis* is of the beetle kind, whence come cantharides, well known in the shops by the name of Spanish flies, and for their use in blisters. They have feelers like bristles, flexible cases to the wings, a breast pretty plain, and the sides of the belly wrinkled. Cantharides differ from each other in their size, shape, and colour, those used in the shops also do the same. The largest in these parts are about an inch long, and as much in circumference, but others are not above three quarters of an inch. Some are of a pure azure colour, others of pure gold, and others again, have a mixture of pure gold and azure colours; but they are all very brilliant, and extremely beautiful. These insects, as is well known, are of the greatest benefit to mankind, making a part in many medicines conducive to human preservation. They are chiefly natives of Spain, Italy, and Portugal; but they are to be met with also about Paris in the summer time, upon the leaves of the ash, the poplar, and the rose-trees, and also among wheat, and in meadows.

We are told, that the country people expect the return of these insects every seven years. It is certain, that such a number of them have been seen together in the air, that they appeared like swarms of bees; and that they have so disagreeable a smell, that it may be perceived a great way off, especially about sun-set, though they are not seen at that time. This bad smell is a guide for those who make it their business to catch them; when they are caught, they dry them: after which they are so light, that fifty will hardly weigh a drachm. Those that gather them, tie them in a bag, or a piece of linen cloth, that has been well worn, and then

they kill them with the vapours of hot vinegar, after which, they dry them in the sun, and keep them in boxes.

An insect of great, though perhaps not equal use in medicine, is that which is known by the name of the *kermes;* it is produced in the excrescence of an oak, called the berry-bearing ilex, and appears at first wrapt up in a membranaceous bladder, of the size of a pea, smooth and shining, of a brownish red colour, and covered with a very fine ash-coloured powder. This bag teems with a number of reddish eggs, or insects, which being rubbed with the fingers, pour out a crimson liquor. It is only met with in warm countries, in the months of May and June.

In the month of April, this insect becomes of the size and shape of a pea, and its eggs some time after burst from the womb, and soon, turning worms, run about the branches and leaves of the tree. They are of two sexes, and the females have been hitherto described; but the males are very distinct from the former, and are a sort of small flies like gnats, with six feet, of which the four forward are short, and the two backward long, divided into four joints, and armed with three crooked nails. There are two feelers on the head, a line and a half long, which are moveable, streaked, and articulated. The tail, at the back part of the body, is half a line long, and forked. The whole body is covered with two transparent wings, and they leap about in the manner of fleas.

The harvest of the kermes is greater or less in proportion to the severity of the winter, and the women gather them before sun-rising, tearing them off with their nails, for fear there should be any loss from the hatching of the insects. They sprinkle them with vinegar, and lay them in the sun to dry, where they acquire a red colour.

An insect, perhaps, still more useful than either of the former, is the *cochineal.*

This insect is of an oval form, of the size of a small pea, with six feet, and a snout or trunk. It brings forth its young alive, and is nourished by sucking the juice of the plant. Its body consists of several rings; and when it is once fixed on the plant, it continues immoveable, being subject to no change. Some pretend there are two sorts, the one domestic, which is best, and the other wild, that is of a vivid colour; however, they appear to be the same, with only this difference, that the wild feed upon uncultivated trees, without any assistance; whereas, the domestic is carefully, at a stated season, removed to cultivated trees, where it feeds upon a purer juice. Those who take care of these insects, place them on the prickly pear-plant, in a certain order, and are

very industrious in defending them from other insects; for if any other kind comes among them, they take care to brush them off with foxes' tails. Towards the end of the year, when the rains and cold weather are coming on, which are fatal to these insects, they take off the leaves or branches, covered with the cochineal that have not attained their utmost degree of perfection, and keep them in their houses till winter is past. These leaves are very thick and juicy, and supply them with nourishment, while they remain within doors. When the milder weather returns, and these animals are about to exclude their young, the natives make them nests, like those of birds, but less, of tree-moss, or soft hay, or the down of cocoa-nuts, placing twelve in every nest. These they fix on the thorns of the prickly pear-plant, and in three or four days time they bring forth their young, which leave their nests in a few days, and creep upon the branches of the plant, till they find a proper place to rest in.

When the native Americans have gathered the cochineal, they put them into holes in the ground, where they kill them with boiling water, and afterwards dry them in the sun, or in an oven, or lay them upon hot plates. From the various methods of killing them, arise the different colours which they appear in when brought to us. While they are living, they seem to be sprinkled over with a white powder, which they lose as soon as the boiling water is poured upon them. Those that are dried upon hot plates are the blackest. What we call the cochineal, are only the females, for the males are a sort of fly, as already observed in the kermes. They are used both for dyeing and medicine, and are said to have much the same virtue as the kermes, though they are now seldom used alone, but are mixed with other things for the sake of the colour.

We shall end this account of the beetle tribe, with the history of an animal which cannot properly be ranked under this species, and yet which cannot be more methodically ranged under any other. This is the insect that forms and resides in the gall-nut, the spoils of which are converted to such useful purposes.

The *gall insects*, are bred in a sort of bodies adhering to a kind of oak in Asia, which differ with regard to their colour, size, roughness, smoothness, and shape, and which we call galls. They are not fruit as some have imagined, but preternatural tumours, owing to the wounds given to the buds, leaves, and twigs of the tree, by a kind of insect that lay their eggs within them. This animal is furnished with an implement, by which the female penetrates into the bark of the tree, or into that spot which just begins to bud, and there

sheds a drop of corrosive fluid into the cavity. Having thus formed a receptacle for her eggs, she deposits them in the place, and dies soon after.

The juice or sap of the plant, thus turned back from its natural course, extravasates and flows round the egg; after which it swells and dilates by the assistance of some bubbles of air, which get admission through the pores of the bark, and which run in the vessels with the sap.

This little ball receives its nutriment, growth, and vegetation, as the other parts of the tree, by slow degrees, and is what we call the gall-nut. The worm that is hatched under this spacious vault, finds in the substance of the ball, which is as yet very tender, a subsistence suitable to its nature; gnaws and digests it till the time comes for its transformation to a nymph, or chrysalis, and from that state of existence changes into a fly. After this the insect, perceiving itself duly provided with all thing requisite, disengages itself soon from its confinement, and takes its flight into the open air. The case, however, is not similar with respect to the gall-nut that grows in autumn. The cold weather frequently comes on before the worm is transformed into a fly, or before the fly can pierce through its inclosure. The nut falls with the leaves, and although you may imagine that the fly which lies within is lost, yet in reality it is not so; on the contrary, its being covered up so close is the means of its preservation. Thus it spends the winter in a warm house, where every crack and cranny of the nut is well stopped up; and lies buried, as it were, under a heap of leaves, which preserves it from the injuries of the weather. This apartment however, though so commodious a retreat in the winter is a perfect prison in the spring. The fly, roused out of its lethargy by the first heats, breaks its way through, and ranges where it pleases. A very small aperture is sufficient, since at this time the fly is but a diminutive creature. Besides, the ringlets whereof its body is composed, dilate, and become pliant in the passage.

Of the GNAT and the TIPULA. There are two insects which entirely resemble each other in their form, and yet widely differ in their habits, manners, and propagation. Those who have seen the tipula, or long-legs, and the larger kind of gnat, have most probably mistaken the one for the other; they have often accused the tipula, a harmless insect, of depredations made by the gnat, and the innocent has suffered for the guilty.

The chief and only difference between them is, that the tipula wants a trunk, while the gnat has a large one, which it often exerts to very mischievous purposes.

The gnat proceeds from a little worm, which is usually seen at the bottom of standing waters. The manner in which the insect lays its eggs is particularly curious; after having laid the proper number on the surface of the water, it surrounds them with a kind of unctuous matter, which prevents them from sinking; but at the same time fastens them with a thread to the bottom, to prevent their floating away at the mercy of every breeze, from a place the warmth of which is proper for their production, to any other where the water may be too cold, or its enemies too numerous. Thus the insects in their egg-state resemble a buoy, which is fixed by an anchor. As they come to maturity, they sink deeper, and at last, when they leave their eggs as worms, they creep at the bottom. They now make themselves lodgments of cement, which they fasten to some solid body at the very bottom of the water, unless by accident, they meet a piece of chalk, which, being of a soft and pliant nature, gives them an opportunity of sinking a retreat for themselves, where nothing but the claws of a cray fish can possibly molest them. The worm afterwards changes its form. It appears with a large head, and a tail invested with hair, and moistened with an oleaginous liquor, which she makes use of as a cork, to sustain her head in the air, and her tail in the water, and to transport her from one place to another. When the oil with which her tail is moistened begins to grow dry, she discharges out of her mouth an unctuous humour which she sheds all over her tail, by virtue whereof she is enabled to transport herself where she pleases, without being either wet, or any wise incommoded by the water.

The gnat in her second state is, properly speaking, in the form of a nymph, which is an introduction or entrance into a new life. In the first place she divests herself of her second skin; in the next she resigns her eyes, her antennæ, and her tail; in short, she actually seems to expire. However, from the spoils of the amphibious animal, a little winged insect cuts the air, whose every part is active to the last degree, and whose whole structure is the just object of our admiration. Its little head is adorned with a plume of feathers, and its whole body invested with scales and hair, to secure it from any wet or dust. She makes trial of the activity of her wings, by rubbing them either against her body, or her broad side-bags, which keep her in an equilibrium. The furbelow, or little border of fine feathers which graces her wings, is very curious, and strikes the eye in the most agreeable manner. There is nothing, however, of greater importance to the gnat than her trunk, and that weak implement may justly be deemed one of Nature's master-pieces. It is so very small,

that the extremity of it can scarcely be discerned through the best microscope that can be procured. That part which is at first obvious to the eye, is nothing but a long scaly sheath under the throat. At near the distance of two thirds of it, there is an aperture, through which the insect darts out four sting, and afterwards retracts them. One of which, however sharp and active it may be, is no more than the case in which the other three lie concealed, and run in a long groove. The sides of these stings are sharpened like two-edged swords; they are likewise barbed, and have a vast number of cutting teeth towards the point, which turns up like a hook, and is fine beyond expression. When all these darts are stuck into the flesh of animals, sometimes one after another, and sometimes all at once, the blood and humours of the adjacent parts must unavoidably be extravasated; upon which a tumour must consequently ensue, the little orifice whereof is closed up by the compression of the external air. When the gnat, by the point of her case, which she makes use of as a tongue, has tasted any fruit, flesh or juice, that she has found out; if it be a fluid, she sucks it up, without playing her darts into it; but in case she finds the least obstruction by any flesh whatever, she exerts her strength, and pierces through it if possibly she can. After this she draws back her stings into their sheath, which she applies to the wound in order to extract, as through a reed, the juices which she finds inclosed. This is the implement with which the gnat performs her work in the summer, for during the winter she has no manner of occasion for it. Then she ceases to eat, and spends all that tedious season either in quarries or in caverns, which she abandons at the return of summer, and flies about in search after some commodious ford, or standing water, where she may produce her progeny, which would be soon washed away and lost, by the too rapid motion of any running stream. The little brood are sometimes so numerous, that the very water is tinged according to the colour of the species, green if they be green, and of a sanguine hue if they be red.

These are circumstances sufficiently extraordinary in the life of this little animal, but it offers something still more curious in the method of its propagation.

However similar insects of the gnat kind are in their appearance, yet they differ widely from each other in the manner in which they are brought forth, for some are produced from eggs, and some are viviparous, and come forth in their most perfect form.

A gnat separated from the rest of its kind, and inclosed in

a glass vessel, with air sufficient to keep it alive, shall produce young which also, when separated from each other, shall be the parents of a numerous progeny. Thus, down for five or six generations, do these extraordinary animals propagate, without any congress between the male and female; but in the manner of vegetables, the young bursting from the body of their parents, without any previous impregnation. At the sixth generation, however, their propagation stops, the gnat no longer produces its like, from itself alone, but it requires the access of the male to give it another succession of fecundity.

The gnat of Europe gives but little uneasiness; it is sometimes heard to hum about our beds at night, and keeps off the approaches of sleep by the apprehension it causes; but it is very different in the ill-peopled regions of America, where the waters stagnate, and the climate is warm, and where they are produced in multitudes beyond expression. The whole air is there filled with clouds of these famished insects; and they are found of all sizes, from six inches long, to a minuteness that even requires the microscope to have a distinct perception of them. The warmth of the mid-day sun is too powerful for their constitution; but when the evening approaches, neither art nor flight can shield the wretched inhabitants from their attacks; though millions are destroyed, still millions more succeed, and produce unceasing torment.

The native Indians, who anoint their bodies with oil, and who have from their infancy been used to their depredations, find them much less inconvenient than those who are newly arrived from Europe; they sleep in their cottages covered with thousands of the gnat kind upon their bodies, and yet do not seem to have their slumbers interrupted by these cruel devourers. If a candle happens to be lighted in one of those places, a cloud of insects at once light upon the flame, and extinguish it; they are therefore obliged to keep their candles in glass lanterns; a miserable expedient to prevent an unceasing calamity!

CHAP. XXXIX.

Of Zoophytes in general—WORMS—*The Earth Worm*—*The Sea Worm*—*The White Water Worm*—*The* STAR FISH—*The Cuttle Fish*—*The* POLYPUS—LITHOPHYTES—*Different Species of Corals*—*Corallines*—*Sponges, &c.*

WE are now come to the last link in the chain of animated nature, to a class of beings so confined in their powers, and so defective in their formation, that some historians have been at a loss whether to consider them as a superior rank of vegetables, or the humblest order of the animated tribe.

In the class of zoophytes, we may place all those animals, which may be propagated by cuttings, or, in other words, which, if divided into two or more parts, each part in time becomes a separate and perfect animal; the head shoots forth a tail, and, on the contrary, the tail produces a head; some of these will bear dividing but into two parts, such is the earth worm; some may be divided into more than two, and of this kind are many of the star-fish; others still may be cut into a thousand parts, each becoming a perfect animal; they may be turned inside out, like the finger of a glove, they may be moulded into all manner of shapes, yet still their vital principle remains, still every single part becomes perfect in its kind, and, after a few days' existence, exhibits all the arts and industry of its parent! We shall therefore divide zoophytes according to their several degrees of perfection, namely into worms star-fish, and polypi; contenting ourselves with a short review of those creatures, that excite our curiosity chiefly by their imperfections.

The first in the class of zoophytes, are animals of the WORM kind, which, being entirely destitute of feet, trail themselves along upon the ground, and find themselves a retreat under the earth, or in the water. As these, like serpents, have a creeping motion, so both, in general, go under the common appellation of reptiles; a loathsome, noxious, malignant tribe, to which man by nature has the strongest antipathy. But though worms, as well as serpents, are mostly without feet, and have been doomed to creep along the earth on their bellies, yet their motions are very different. The serpent, as has been said before, having a back bone,

which it is incapable of contracting, bends its body into the form of a bow, and then shoots forward from the tail; but it is very different with the worm, which has a power of contracting or lengthening itself at will. There is a spiral muscle, that runs round its whole body, from the head to the tail, somewhat resembling a wire wound round a walking-cane, which, when slipped off, and one end extended and held fast, will bring the other nearer to it; in this manner the earth-worm, having shot out or extended its body, takes hold by the slime of the fore part of its body, and so contracts and brings forward the hinder part; in this manner it moves onward, not without great effort; but the occasions for it progressive motion are few.

As it is designed for living under the earth, and leading a life of obscurity, so it seems tolerably adopted to its situation. Its body is armed with small stiff sharp burs or prickles, which it can erect or depress at pleasure; under the skin there lies a slimy juice, to be ejected as occasion requires at certain perforations, between the rings of the muscles to lubricate its body, and facilitate its passage into the earth. Like most other insects, it has breathing holes along the back, adjoining each ring; but it is without bones, without eyes, without ears, and, properly, without feet. It has a mouth, and also an alimentary canal, which runs along to the very point of the tail. In some worms, however, particularly such as are found in the bodies of animals, this canal opens towards the middle of the belly, at some distance from the tail. The intestines of the earth-worm are always found filled with a very fine earth, which seems to be the only nourishment these animals are capable of receiving.

The animal is entirely without brain, but near the head is placed the heart, which is seen to beat with a very distinct motion, and round it are the spermatic vessels, forming a number of little globules, containing a milky fluid, which have an opening into the belly, not far from the head: they are also often found to contain a number of eggs, which are laid in the earth, and are hatched in twelve or fourteen days into life, by the genial warmth of their situation.

When the eggs are laid in the earth, which, in about fourteen days, as has been said, are hatched into maturity, the young ones come forth very small, but perfectly formed, and suffer no change during their existence: but how long their life continues is not well known, but it certainly holds for more than two or three seasons. During the winter, they bury themselves deeper in the earth, and seem, in some measure, to share the general torpidity of the insect tribe In

spring, they revive with the rest of nature, and on those occasions, a moist or dewy evening brings them forth from their retreats, for the universal purpose of continuing their kind. They chiefly live in a light, rich and fertile soil, moistened by dews or accidental showers, but avoid those places where the water is apt to lie on the surface of the earth, or where the clay is too stiff for their easy progression under ground.

Helpless as they are formed, yet they seem very vigilant in avoiding those animals that chiefly make them their prey; in particular, the mole, who feeds entirely upon them beneath the surface, and who seldom ventures, from the dimness of its sight, into the open air; him they avoid, by darting up from the earth, the instant they feel the ground move: and fishermen, who are well acquainted with this, take them in what numbers they choose, by stirring the earth where they expect to find them. They are also driven from their retreats under ground, by pouring bitter or acid water thereon, such as that water in which green walnuts have been steeped, or a lye made of potashes.

Such is the general outline of the history of these reptiles, which, as it should seem, degrades them no way beneath the rank of other animals of the insect creation; but we now come to a part of their history which proves the imperfection of their organs, from the easiness with which these little machines may be damaged and repaired again. It is well known in mechanics, that the finest and most complicated instruments are the most easily put out of order, and the most difficult to set right; the same also obtains in the animal machine.

Man, the most complicated machine of all, whose nerves are more numerous, and powers of action more various, is most easily destroyed: he is seen to die under wounds which a quadruped or a bird would easily survive; and as we descend gradually to the lower ranks, the ruder the composition, the more difficult it is to disarrange it. Some animals live without their limbs, and often are seen to reproduce them; some are seen to live without their brain for many weeks together: caterpillars continue to increase and grow large, though all their nobler organs are entirely destroyed within; some animals continue to exist, though cut in two, their nobler parts preserving life, while the others perish that were cut away; but the earth-worm, and all the zoophyte tribe, continue to live in separate parts, and one animal, by the means of cutting, is divided into two distinct existences, sometimes into a thousand.

Spalanzani has tried several experiments upon the earth-worm, many of which succeeded according to his expectation; every earth-worm, however, did not retain the vivacious principle with the same obstinacy; some, when cut in two, were entirely destroyed; others survived only in the nobler part; and, while the head was living, the tail entirely perished, and a new one was seen to burgeon from the extremity. But, what was most surprising of all, in some, particularly in the small red-headed earth-worm, both extremities survived the operation; the head produced a tail with the anus, the intestines, the annular muscle, and the prickly beards; the tail part, on the other hand, was seen to shoot forth the nobler organs, and in less than the space of three months sent forth a head, and a heart, with all the apparatus and instruments of generation. This part, as may be easily supposed, was produced much more slowly than the former, a new head taking above three or four months for its completion, a new tail being shot forth in less than as many weeks. Thus two animals by dissection were made out of one, each with their separate appetites, each endued with life and motion, and seemingly as perfect as that single animal whence they derived their origin.

What was performed upon the earth-worm, was found to obtain also in many other of the vermicular species.

The *sea-worm*, the *white water-worm*, and many of those little worms with feelers, found at the bottom of dirty ditches: in all these the nobler organs are of such little use, that if taken away, the animal does not seem to feel the want of them; it lives in all its parts, and in every part; and, by a strange paradox in nature, the most useless and contemptible life is, of all others, the most difficult to destroy.

The next genus of zoophytes is that of the STAR-FISH, a numerous tribe, shapeless and deformed, assuming at different times different appearances. The same animal that now appears round like a ball, shortly after flattens as thin as a plate. All of this kind are formed of a semi-transparent gelatinous substance, covered with a thin membrane, and, to an inattentive spectator, often appears like a lump of inanimated jelly, floating at random upon the surface of the sea, or thrown by chance on shore at the departure of the tide. But, upon a more minute inspection, they will be found possessed of life and motion; they will be found to shoot forth their arms in every direction, in order to seize upon such insects as are near, and to devour them with great rapacity. Worms, the spawn of fish, and even muscles themselves, with their hard

resisting shells have been found in the stomachs of these voracious animals; and what is very extraordinary, though the substance of their own bodies be almost as soft as water, yet they are no way injured by swallowing these shells, which are almost of a stony hardness. They increase in size as all other animals do. In summer, when the water of the sea is warmed by the heat of the sun, they float upon the surface, and in the dark they send forth a kind of shining light, resembling that of phosphorus.

They are often seen fastened to the rocks, and to the largest sea-shells as if to derive their nourishment from them. If they be taken and put into spirit of wine, they will continue for many years entire; but if they be left to the influence of the air, they are, in less than four and twenty hours, melted down into limpid and offensive water.

In all of this species, none are found to possess a vent for their excrements, but the same passage by which they devour their food, serves for the ejection of their fœces. These animals, as was said, take such a variety of figures, that it is impossible to describe them under one determinate shape; but, in general, their bodies resemble a truncated cone, whose base is applied to the rock to which they are found usually attached. Though generally transparent, yet they are found of different colours, some inclining to green, some to red, some to white, and some to brown. In some, their colours appear diffused over the whole surface; in some they are streaked, and in others often spotted. They are possessed of a very slow progressive motion, and, in fine weather they are continually seen, stretching out and fishing for their prey. Many of them are possessed of a number of long slender filaments, in which they entangle any small animal they happen to approach, and thus draw them into their enormous stomach, which fills the whole cavity of their bodies. The harder shells continue for some weeks undigested but at length they undergo a kind of maceration in the stomach, and become a part of the substance of the animal itself. The indigestible parts are returned by the same aperture by which they were swallowed, and then the star-fish begins to fish for more. These also may be cut in pieces, and every part will survive the operation; each becoming a perfect animal, endued with its natural rapacity. Of this tribe, the number is various, and the description of each would be tedious and uninstructive; the manners and nature of all are nearly as described; but we will just make mention of one creature, which, though not properly belonging to this class, yet is so

nearly related, that the passing it in silence would be an unpardonable omission.

Of all animals, the *cuttle-fish*, though in some respects superior to this tribe, possesses qualities the most extraordinary. It is about two feet long, covered with a very thin skin, and its flesh composed of a gelatinous substance, which, however, withinside is strengthened by a strong bone, of which such great use is made by the goldsmith. It is possessed of eight arms, which it extends, and which are probably of service to it in fishing for its prey; while alive, it is capable of lengthening or contracting these at pleasure; but when dead, they contract, and lose their rigidity. They feed upon small fish, which they seize with their arms; and they are bred from eggs, which are laid upon the weeds along the sea-shore.

The cuttle-fish is found along many of the coasts of Europe, but are not easily caught, from a contrivance with which they are furnished by nature; this is a black substance, of the colour of ink, which is contained in a bladder generally on the left side of the belly, and which is ejected in the manner of an excrement from the anus. Whenever, therefore, this fish is pursued, and when it finds a difficulty of escaping, it spurts forth a great quantity of this black liquor, by which the waters are totally darkened; and then it escapes, by lying close at the bottom. In this manner the creature finds its safety, and men find ample cause for admiration, from the great variety of stratagems with which creatures are endued for their peculiar preservation.

The COMMON POLYPUS is found at the bottom of wet ditches, or attached to the under surface of the broad-leafed plants that grow and swim on the waters. The same difference holds between these and the sea-water polypus, as between all the productions of the sea, and of the land and the ocean. The marine vegetables and animals grow to a monstrous size. The eel, the pike, or the bream, of fresh waters, are but small; but in the sea, they grow to an enormous magnitude. The herbs of the field are at most but few feet high; those of the sea often shoot forth a stalk of a hundred. It is so between the polypi of both elements. Those of the sea are found from two feet in length, to three or four; and Pliny has even described one, the arms of which were no less than thirty feet long. Those in fresh water, however, are comparatively minute; at their utmost size, seldom above three

parts of an inch long; and when gathered up into their usual form, not above a third even of those dimensions.

It was upon these minute animals that the power of dissection was first tried in multiplying their numbers. They had been long considered as little worthy the attention of observers, and were consigned to that neglect in which thousands of minute species of insects remain to this very day. It is true, indeed, that Reaumur observed, classed, and named them. By contemplating their motions, he was enabled distinctly to pronounce on their being of the animal, and not of the vegetable kingdom; and he called them polypi, from their great resemblance to those larger ones that were found in the ocean. Still, however, their properties were neglected, and their history unknown.

Mr. Trembley was the person to whom we owe the first discovery of the amazing properties and powers of this little vivacious creature: he divided this class of animals into four different kinds; into those inclining to green, those of a brownish cast, those of flesh colour, and those which he calls the polype de panche. The difference of structure in these, as also of colour are observable enough; but the manner of their subsisting, of seizing their prey, and of their propagation, is pretty nearly the same in all.

Whoever has looked with care into the bottom of a wet ditch, when the water is stagnant, and the sun has been powerful, may remember to have seen many little transparent lumps of jelly, about the size of a pea, and flatted on one side; such also as have examined the under side of the broad leafed weeds that grow on the surface of the water, must have observed them studded with a number of these little jelly-like substances, which were probably then disregarded, because their nature and history was unknown. These little substances, however, were no other than living polypi gathered up into a quiescent state, and seemingly inanimate, because either undisturbed, or not excited by the calls of appetite to action. When they are seen exerting themselves, they put on a very different appearance from that when at rest; to conceive a just idea of their figure, we may suppose the finger of a glove cut off at the bottom; we may suppose also several threads or horns planted round the edge like a fringe. The hollow of this finger will give us an idea of the stomach of the animal; the threads issuing forth from the edges may be considered as the arms or feelers, with which it hunts for its prey. The animal, at its greatest extent, is seldom seen above an inch and a half long, but it is much shorter when it is contracted and at rest; it is furnished neither with muscles nor rings, and

its manner of lengthening or contracting itself more resembles that of the snail than worms, or any other insect. The polypus contracts itself more or less, in proportion as it is touched, or as the water is agitated in which they are seen. Warmth animates them, and cold benumbs them; but it requires a degree of cold approaching congelation, before they are reduced to perfect inactivity; those of an inch have generally their arms double, often thrice as long as their bodies. The arms, where the animal is not disturbed, and the season not unfavourable, are thrown about in various directions, in order to seize and entangle its prey; sometimes three or four of the arms are thus employed, while the rest are contracted like the horns of a snail, within the animal's body. It seems capable of giving what length it pleases to these arms; it contracts and extends them at pleasure, and stretches them only in proportion to the remoteness of the object it would seize.

These animals have a progressive motion, which is performed by the power they have of lengthening and contracting themselves at pleasure; they go from one part of the bottom to another; they mount along the margin of the water, and climb up the side of aquatic plants. They often are seen to come to the surface of the water, where they suspend themselves by their lower end. As they advance but very slowly, they employ a great deal of time in every action, and bind themselves very strongly to whatever body they chance to move upon as they proceed; their adhesion is voluntary, and is probably performed in the manner of a cupping-glass applied to the body.

All animals of this kind have a remarkable propensity to turn towards the light, and this naturally might induce an inquirer to look for their eyes; but however carefully this search has been pursued, and however excellent the microscope with which every part was examined, yet nothing of the appearance of this organ was found over the whole body: and it is most probable, that, like several other insects, which hunt their prey by their feeling, these creatures are unfurnished with advantages which would be totally useless for their support.

In the centre of the arms, it was said before, the mouth is placed, which the animal can open and shut at pleasure, and this serves at once as a passage for food, and an opening for it after digestion. The inward part of the animal's body seems to be one great stomach, which is open at both ends; but the purposes which the opening at the bottom serves are hitherto unknown, but certainly not for excluding their excrements, for these are ejected at the aperture by which they are

taken in. If the surface of the body of this little creature be examined with a microscope, it will be found studded with a number of warts, as also the arms, especially when they are contracted; and these tubercles, as we shall presently see, answer a very important purpose.

If we examine their way of living, we shall find these insects chiefly subsisting upon others much less than themselves; particularly a kind of millepedes that live in the water, and a very small red worm, which they seize with great avidity. In short, no insect whatsoever, less than themselves, seems to come amiss to them; their arms, as was observed above, serve them as a net would a fisherman, or perhaps, more exactly speaking, as a lime-twig does a fowler. Whenever their prey is perceived, which the animal effects by its feeling, it is sufficient to touch the object it would seize upon, and it is fastened without a power of escaping. The instant one of this insect's long arms is laid upon a millepede, the little insect sticks without a possibility of retreating. The greater the distance at which it is touched, the greater is the ease with which the polybus brings the prey to its mouth. If the little object be near, though irretrievably caught, it is not without great difficulty that it can be brought to the mouth and swallowed. When the polybus is unsupplied with prey, it testifies its hunger by opening its mouth; the aperture, however, is so small, that it cannot be easily perceived; but when, with any of its long arms, it has seized upon its prey, it then opens its mouth distinctly enough, and this opening is always in proportion to the size of the animal which it would swallow; the lips dilate insensibly by small degrees, and adjust themselves precisely to the figure of their prey. Mr. Trembley, who took a pleasure in feeding this useless brood, found that they could devour aliments of every kind, fish and flesh, as well as insects; but he owns they did not thrive so well upon beef and veal, as upon the little worms of their own providing. When he gave one of these famished reptiles any substance which was improper to serve for aliment, at first it seized the prey with avidity, but after keeping it for some time entangled near the mouth, let it drop again with distinguished nicety.

When several polypi happen to fall upon the same worm, they dispute their common prey with each other. Two of them are often seen seizing the same worm at different ends, and dragging it in opposite directions with great force. It often happens, that while one is swallowing its respective end, the other is also employed in the same manner, and thus they

continue swallowing each his part, until their mouths meet together; they then each rest, for some time in this situation, till the worm breaks between them, and each goes off with his share; but it often happens that a seemingly more dangerous combat ensues, when the mouths of both are thus joined upon one common prey together; the largest polypus then gapes and swallows his antagonist; but what is very wonderful, the animal thus swallowed seems to be rather a gainer by the misfortune. After it has lain in the conqueror's body for about an hour, it issues unhurt, and often in possession of the prey which had been the original cause of contention; how happy would it be for men, if they had as little to fear from each other!

These reptiles continue eating the whole year, except when the cold approaches to congelation; and then, like most others of the insect tribe, they feel the general torpor of nature, and all their faculties are for two or three months suspended; but if they abstain at one time, they are equally voracious at another; and, like snakes, ants, and other animals that are torpid in the winter, the meal of one day suffices them for several months together In general, however, they devour more largely in proportion to their size, and their growth is quick according as they are fed; such as are best supplied, soonest acquire their largest size; but they diminish also in their growth with the same facility, if their food be taken away.

Such are the more obvious properties of these little animals, but the most wonderful still remain behind. Their manner of propagation, or rather multiplication, has for some years been the astonishment of all the learned of Europe. They are produced in as great a variety of manner as the different species of vegetables. Some polypi are propagated from eggs, as plants are from their seeds; some are produced by buds issuing from their bodies, while all may be multiplied by cuttings, and this to a degree of minuteness that exceeds even philosophical perseverance.

With respect to such of this kind as are hatched from the egg, little that is curious can be added; but with regard to such as are produced like buds, from their parent stem, or like cuttings from an original root, their history requires a more detailed explanation. If a polypus be carefully observed in summer, when these animals are chiefly active, and more particularly prepared for propagation, it will be found to send forth, from different parts of its body, several tubercles, or little knobs, which grow larger and larger every day; after two or three days inspection, what at first appeared but

a small excrescence, takes the figure of a small animal, entirely resembling its parent, furnished with feelers, a mouth, and all the apparatus for seizing and digesting its prey. This little creature every day becomes larger, like the parent, to which it continues attached; it spreads its arms to seize upon whatever insect is proper for aliment, and devours it for its own particular benefit; thus, it is possessed of two sources of nourishment, that which it receives from the parent by the tail, and that which it receives from its own industry by the mouth. The food which these animals receive often tinctures the whole body; and upon this occasion the parent is often seen communicating a part of its own fluids to that of its progeny that grows upon it; while, on the the contrary, it never receives any tincture from any substance that is caught and swallowed by its young. If the parent swallows a red worm, which gives a tincture to all its fluids, the young one partakes of the paternal colour; but if the latter should seize upon the same prey, the parent polypus is no way benefited by the capture, but all the advantage remains with the young one.

But we are not to suppose that the parent is capable of producing only one at a time; several young ones are thus seen at once, of different sizes, growing from its body; some just budding forth, others acquiring their perfect form, and others come to sufficient maturity, and just ready to drop from the original stem, to which they had been attached for several days. But what is more extraordinary still, those young ones themselves that continue attached to their parent, are seen to burgeon and propagate their young ones also, each holding the same dependence upon its respective parent, and possessed of the same advantages that have been already described in the first connection.

This seems to be the most natural way by which these insects are multiplied; their production from the egg being not so common; and though some of this kind are found with a little bladder attached to their bodies, which is supposed to be filled with eggs, which afterwards come to maturity, yet the artificial method of propagating these animals is much more expeditious, and equally certain; it is indifferent whether one of them be cut into ten, or ten hundred parts, each becomes as perfect an animal as that which was originally divided; but it must be observed, that the smaller the part which is thus separated from the rest, the longer it will be in coming to maturity, or in assuming its perfect form.

Besides these kinds mentioned by Mr. Trembley, there are various others, which have been lately discovered by the

vigilance of succeeding observers, and some of these so strongly resemble a flowering vegetable in their forms, that they have been mistaken by many naturalists for such.

Mr. Hughes, the author of the Natural History of Barbadoes, has described a species of this animal, but has mistaken its nature, and called it a sensitive flowering plant; he observed it to take refuge in the holes of rocks, and, when undisturbed, to spread forth a number of ramifications, each terminated by a flowery petal, which shrunk at the approach of the hand, and withdrew into the hole, whence before it had been seen to issue. This plant, however, was no other than an animal of the polypus kind, which is not only to be found in Barbadoes, but also on many parts of the coast of Cornwall, and along the shores of the Continent.

LITHOPHYTES and SPONGES. If we examine the bottom of the sea, along some shores, and particularly at the mouths of several rivers, we shall find it has the appearance of a forest of trees under water, millions of plants growing in various directions, with their branches entangled in each other, and sometimes standing so thick as to obstruct navigation. The shores of the Persian gulph, the whole extent of the Red sea, and the western coasts of America, are so choked up in many places with these coraline substances, that though ships force a passage through them, boats and swimmers find it impossible to make their way. These aquatic groves are formed of different substances, and assume various appearances.

The *coral* plants, as they are called, sometimes shoot out, like trees without leaves in winter; they often spread out a broad surface like a fan, and not uncommonly a large bundling head, like a faggot; sometimes they are found to resemble a plant with leaves and flowers, and often the antlers of a stag, with great exactness and regularity. In other parts of the sea are seen sponges, of various magnitude, and extraordinary appearances, assuming a variety of phantastic forms, like large mushrooms, mitres, fonts, and flower-pots.

If in our researches after the nature of these plants, we should be induced to break off a branch of the coraline substance, and observe it carefully, we shall perceive its whole surface, which is very rugged and irregular, covered with a mucous fluid, and almost in every part studded with little jelly like drops, which, when closely examined, will be found to be no other than insects of the polypus kind. These have their motions, their arms, their appetites exactly resembling those described in the last chapter; but they

soon expire when taken out of the sea, and our curiosity is at once stopped in its career by the animals ceasing to give any instance of their industry; recourse, therefore has been had to other expedients, in order to determine the nature of the inhabitant, as well as the habitation.

If a coraline plant be strictly observed while still growing in the sea, and the animals upon its surface be not disturbed, either by the agitation of the waters, or the touch of the observer, the little polypi will then be seen in infinite numbers, each issuing from its cell, and in some kinds, the head covered with a little shell, resembling an umbrella, the arms spread abroad, in order to seize its prey, while the hinder part still remains attached to its habitation, whence it never wholly removes. By this time it is perceived that the number of inhabitants is infinitely greater than was at first suspected; that they are all assiduously employed in the same pursuits, and that they issue from their respective cells, and retire into them at pleasure. Still, however, there are no proofs that those large branches which they inhabit are entirely the construction of such feeble and minute animals. But chemistry will be found to lend a clue to extricate us from our doubts in this particular. Like the shells which are formed by snails, muscles, and oysters, these coraline substances effervesce with acids, and may therefore be supposed to partake of the same animal nature. But Mr. Ellis went still farther, and examined their operations, just as they were beginning. Observing an oyster-bed, which had been for some time neglected, he there perceived the first rudiments of a coraline plantation, and tufts of various kinds shooting from different parts of this favourable soil. It was upon these he tried his principal experiment. He took out the oysters which were thus furnished with coralines, and placed them in a large wooden vessel, covering them with sea-water. In about an hour he perceived the animals, which before had been contracted by handling, and had shewn no signs of life, expanding themselves in every direction, and appearing employed in their own natural manner. Perceiving them therefore in this state, his next aim was to preserve them thus expanded, so as to be permanent objects of curiosity. For this purpose he poured, by slow degrees, an equal quantity of boiling water into the vessels of sea-water in which they were immersed. He then separated each polypus with pincers from its shell, and plunged each separately into small crystal vases, filled with spirits of wine mixed with water. By this means, the animal was preserved entire, without having time to contract itself, and he thus

perceived a variety of kinds, almost equal to that variety of productions which these little animals are seen to form.

He has been thus able to perceive and describe fifty different kinds, each of which is seen to possess its own peculiar mode of construction, and to form a coraline that none of the rest can imitate. It is true, indeed, that on every coraline substance there are a number of polypi found, no way resembling those which are the erectors of the building.

But, in general, the same difference that subsists between the honeycomb of the bee, and the paper-like cells of the wasp, subsists between the different habitations of the coral-making polypi.

With regard to the various forms of these substances, they have obtained different names from the nature of the animal that produced them, or the likeness they bear to some well-known object, such as *corallines*, *fungimadripores*, *sponges astroites*, and *keratophytes*.

When examined chemically, they all discover the marks of animal formation; the corals, as was said, dissolve in acids, the sponges burn with an odour strongly resembling that of burnt horn. We are left somewhat at a loss with regard to the precise manner in which this multitude of cells, which at last assume the appearance of a plant or flower, are formed. If we may be led in this subject by analogy, it is most probable, that the substance of coral is produced in the same manner that the shell of the snail grows round it; these little reptiles are each possessed of a slimy matter, which covers its body, and this hardening, as in the snail, becomes an habitation exactly fitted to the body of the animal that is to reside in it; several of these habitations being joined together, form at length a considerable mass, and, as most animals are productive in proportion to their minuteness, so these multiplying in a surprising degree, at length form those extensive forests that cover the bottom of the deep.

CHAP. XL.

Of the Vegetable World.—Theory of Vegetation—Anatomy of Plants—Circulation of the Vegetable Juices—Fructification, &c. of Plants—Of the Sexual System—The Science of Botany—The Classes, Orders, and Genera of Linnæus—The natural Classification of Vegetables—Conclusion.

In the progress of our examination of the natural world, with our illustrious philosopher, we commenced with a slight examination of the materials of which this ALL is composed; we detailed what is generally known of the formation, structure, and principal phenomena of the earth. We took a short review of man in his various relations and situations; and successively passed through the several gradations of animal nature. From that insensible and almost inanimate class of beings of which we so lately treated, the transition to the vegetable world is easy; a department which presents to the casual observer an almost infinite variety—but the variety is only external; the nature, the habits, the manners (if we may so express ourselves) of all vegetables nearly resemble each other, and we must be content with little more than mere classification and arrangement, unless we would depart from the province of the naturalist, to intrude upon those of the chemist, the physician, or the farmer.

Of the theory of vegetation, or of the growth, propagation, and nutriment of vegetables, our knowledge is slight and superficial. A close inspection into the structure of plants, affords the best ground for reasoning on this subject, and, indeed, every thing beyond it is little better than mere fancy and conjecture.

On making a transverse section of a tree, it appears to consist of three distinct parts, the bark, the wood, and the medulla, or pith.

1. The bark consists of two parts, the cuticle, and the true bark. The cuticle of plants affords an external covering to all their parts. It consists of numerous layers, easily separable from each other, and of which the fibres are circular. The true bark may be considered as a congeries of cellular

substance, in which are placed two kinds of organs, the vessels peculiar to the plants, and the longitudinal fibres. Of the use of these nothing can be said at present.

2. On removing the bark, the wood appears. Its substance is denser than the bark, and its structure more difficult to be demonstrated. But it has been discovered likewise to contain *vasa propria*, and longitudinal fibres, and besides these, large vessels with spiral coats, which run from one end of the tree to the other, and are denominated *vasa æra*, or air vessels. Between the wood and the pith lies a green coloured substance, first accurately described by Dr. John Hill, and by him affirmed to contain all the parts of the plant in embryo; he gave it the name of Corona.

3. In the centre of the tree resides the pith, which, in young plants is very abundant. As they approach to maturity it grows drier, and appears in a smaller quantity; and in very aged trees it is entirely obliterated. Its substance is cellular, and, according to the author just mentioned, is of a similar structure in all plants. These are the solid parts of vegetables.

But there are likewise fluids, or juices in vegetables; and these are of two kinds. The one is of the same nature in all the variety of vegetables; the other varies according to the different plants in which it exists. The former, which is called the *succus communis*, when collected early in the spring, from an incision made in the birch, or vine, differs little from common water. The latter, which is named the *succus proprius*, possesses various properties in various plants, and gives to each its sensible qualities. These two juices never mingle with each other in the tree; and the latter is found in the *vasa propria* only.

It is not yet ascertained, whether the juices of plants are transmitted through vessels, or a cellular substance. Each side of the question has had its advocates, who have supported their respective opinions with probable arguments; but it is to be regretted that, on so interesting a subject, no conclusion can be formed from the actual direction of vegetables. It, however, seems most probable, that all the fluids of plants are transmitted through vessels.

Of the Course of the Succus Communis, or *Sap*. Botanists have made many experiments to ascertain the course of the sap. Early in the spring, when the sap begins to flow, incisions have been made in the trunk and branches of trees, as far as the pith; and, in such cases it has been

constantly found that a larger quantity of sap flowed from the superior, than from the inferior margin of the incision. This circumstance led to the opinion, that in the beginning of the spring, great quantities of moisture are absorbed by trees from the atmosphere, and hence the source of the abundance of sap. But this conclusion is found to disagree with the phenomena of nature, from the two following experiments.

1. Incisions of various heights being made in the stem of several plants, their roots were immersed in a decoction of logwood. The roots absorbed the coloured liquor, which at length began to flow from the superior, and not from the inferior margins of the incisions: nor had the liquor extended itself much upwards, beyond the margin of the incision from which it was discharged.

2. In the season when the sap flows most abundantly, called the bleeding season, a deep cut was made into the branch of a growing vine, and the greatest quantity of sap was discharged from the upper margin of the incision; but a branch of the same tree, cut in the same manner, being inverted, the sap flowed most copiously from the other margin of the incision, which of course was now that next the root. On the other hand, many experiments may be brought to prove directly that in the bleeding season the sap ascends from the root towards the branches; the following, however, may suffice:

1. Early in the spring, when little or no sap had as yet entered the plant, Dr. Hope made a number of incisions, of different altitudes, into the root and stem of a birch. As the sap rose, it first flowed from the superior margin of the lowest incision, and then, in regular succession, from the upper margins of the other incisions, till, at last, it reached the highest.

2. If, in the beginning of the bleeding season, before the sap is found in the stem or branches, an incision be made in the root of a vine, a considerable flow of sap will follow the wound.

3. The quantity of sap is very generally proportioned to the humidity of the soil.

Of the course of the Succus Proprius. When a portion of the bark and wood of the pine is cut from the stem, the *succus proprius* flows in considerable quantity, both from the upper and under margin of the incision. Hence it occurred to botanists, that this juice might have little or no motion, and that its efflux from such an orifice might depend

entirely on its being freed from the pressure of the bark and wood. But we cannot accede to this opinion: for although in the beginning, the *succus proprius* flows from both margins of the incision, in a little while it is discharged from the superior margin only.

Hence it appears clearly, that the course of this juice in its vessels is never from the roots towards the branches, but always in the contrary direction.

Besides the vessels of the succus proprius, and those conveying the sap, a third kind are found in vegetables, named air-vessels, or *vasa aeria*. These are chiefly situated in the wood, leaves, and petals, but are wanting in the bark of trees, and in the herbaceous plants. They are formed by a number of small filaments, spirally rolled up, so as to form a cavity in the middle. The name of *vasa aeria* has been given them, because they are empty of liquor, and because a great quantity of air is certainly found in the wood of plants, where these vessels are chiefly placed, and where there is no peculiar organization. They are supposed to be the instruments of respiration in vegetables; but in what manner this function is performed, is not clearly understood.

Dr. Hill has demonstrated, that the cuticle of plants is an organized substance, containing vessels. In trees and shrubs these vessels have an external opening; but in the herbaceous plants this is wanting. Trees and shrubs only are possessed of *vasa aeria*; and, when a plant is placed under the exhausted receiver of an air-pump, the air enters through the cuticle, and only issues from the wood, in which the *vasa aeria* are situated. From these circumstances taken together, and considered attentively, we have reason to conclude, that the air's proper entrance to the *vasa aeria* is through these cuticular vessels. Thus, in the early part of the spring, the gentle heat expands the mouths of these vessels, before contracted by the winter's cold. Into these orifices the external air rushes and presses down to the roots. To these it gives energy, as it does to the moving fibres of animals; and by its pressure it may assist in propelling the juice upwards. An additional quantity of air is evolved by the internal motions of the plant, and the whole passes off with the perspirable matter. In this way, there seems to be a circulation of air through plants, assisting and assisted by the powers which move the juices.

On this account, trees overgrown with moss have few leaves, weak shoots, and no fruit. The practice of gardeners is therefore to be commended, who, in the spring, strip the moss from the bark of aged trees, and thus

admitting the accession of the air, restore them to verdure and fruitfulness.

Having considered the course of the fluids in vegetables, we next proceed to examine the powers by which these fluids are moved.

Capillary attraction has generally been accounted the cause of the motion of the juices of plants; and the permanence of the action of this power has been supposed to depend on the evaporation from the leaves. Of late years, indeed, botanists have ascribed to plants a vital power, which they believe assists the flow of the juices; and this opinion is supported by the following reasons:

1. The descent of the juices, that is, their return from the branches to the roots, cannot be explained, without the supposition of a vital power regulating the motion. A flow of fluids, through capillary tubes, will only take place when the resistance at the one end is diminished. This might account for the rising of the sap, when warmth is applied to the leaves, but cannot account for its descending in the same circumstances, that is, when the atmosphere is warmer than the earth. But this takes place constantly with respect to the succus proprius, and, it is probable, that part of the sap has the same course, both in the day and night.

2. The exertions of many plants on the application of stimuli, afford another argument in support of their muscular power, and the spontaneous motions of other plants confirm the same opinion.

3. Light admitted to plants increases their perspiration, and causes a leaf, before inverted, to resume its natural position. The influence of darkness counteracts these effects, and produces what is called sleep in plants, although the heat of the atmosphere be not diminished. These facts seem to prove the irritability, or muscular power, of vegetables.

4. If the fluids of plants are conveyed through vessels, can we suppose these tubes to be of so small a diameter, as, by capillary attraction alone, to raise the juices from the roots to the summits of the loftiest trees?

5. On the supposition of the fluids being moved entirely by capillary attraction, how happens it, that the sap of the vine flows from an incision made in the spring, and not from one made in summer? In this case, as the vessels remain the same, and the heat is at least not diminished, the efflux of sap ought to be equally copious in summer as in spring.

6. Capillary tubes filled with liquor do not discharge their contents when broken across. But from the stem of a vine

cut transversely, a large quantity of fluids is discharged, as has been demonstrated by Dr. Hales.

Plants, as well as animals, perspire; and in both cases this function is essential to health. By the experiments of Dr. Hales, and M. Guettard, it appears, that the perspirable matter of vegetables differs in no respect from pure water, excepting that it becomes rather sooner putrid. The quantity perspired varies, according to the extent of the surface from which it is emitted, the temperature of the air, the time of the day, and the humidity of the atmosphere. As the leaves form the greatest part of the surface, it is natural to suppose that the quantity of these will very materially affect the quantity of the perspiration. Accordingly, the experiments of Dr. Hales have ascertained, that the perspiration of vegetables is increased or diminished, chiefly in proportion to the increase or diminution of their foliage. The degree of heat in which the plant was kept, according to the same author, varied the quantity of matter perspired, this being greater in proportion to the greater heat of the surrounding atmosphere. The degree of light has likewise considerable influence in this respect: for Mr. Philip Miller's experiments prove that plants uniformly perspire most in the forenoon, though the temperature of the air in which they are placed should be unvaried. M. Guettard likewise informs us, that a plant exposed to the rays of the sun has its perspiration increased to a much greater degree than if it had been exposed to the same heat under the shade. Finally, the perspiration of vegetables is increased in proportion as the atmosphere is dry, or in other words, diminished in proportion as the atmosphere is humid.

The more vigorous and healthy the plants, the more copious the perspiration; this function, like the rest, depending much on the vital energy. Excessive perspiration seems to hurt, and even sometimes to destroy vegetables; defective perspiration is equally injurious. It is also found, that this function is performed chiefly, if not altogether, by the leaves and young shoots. That it may be properly carried on, all leaves are deciduous; in those trees called ever-greens, there being a constant succession of leaves, to prevent the organ of perspiration from becoming rigid.

Dr. Hales first observed, that a quantity of moisture is absorbed by plants, when exposed to a humid atmosphere, this absorption, as well as the perspiration, is performed by the leaves; but in what manner has not yet been ascertained Experiments made by M. Guettard shew, that perspiration is more considerable from the upper than from the under surface

of leaves; and those of the same author, of Duhamel, and Bonnet, demonstrate, that absorption, on the contrary, is much greater at the inferior surface than at the superior. To prove this, the superior surface of one leaf, and the inferior surface of another, were covered with varnish, and the consequence was, that the former, in a given time, suffered little diminution of weight, but the latter became much lighter. Again, similar leaves were laid upon a surface of water, and it followed, that those which had their superior surface inverted, gained little weight, and for the most part died in a few days; while such as had their inferior surface applied to the water, became much heavier, and flourished many months. These facts make it evident, that the perspiration and absorption are not performed by the same vessels, but that each has its peculiar organs.

It has been commonly supposed that perspiration takes place chiefly when the air is warm; and absorption, on the other hand, when it is cold and moist. But, unless the vessels peculiar to absorption, which are placed in the under surface of the leaves, were kept constantly in action, they would necessarily collapse or decay. All absorbing organs have a peculiar structure, and an action depending on life, that such an organization is present in the leaves of plants, it is reasonable to conclude, because dried leaves do not absorb. The same reasoning is applicable to the absorption performed by the roots: for when a small portion of the root of a hyacinth growing in water is cut off, the whole root dies, and new roots are shot out, having their extremities peculiarly adapted to the absorption of nourishment.

The noxious matter carried off by perspiration, requires large dilution to prevent its hurting the delicate structure of the leaves, and in this state accordingly it is thrown out on their surface. Here the noxious part is excreted, but part of the diluting fluid is re-absorbed, to serve the purpose of secretion, which could not be performed, unless the common juice, or sap, were previously prepared. In the same manner, in the animal's body, saline and putrid matter, carried off by the urine, must be liberally diluted, to prevent it from injuring the tender structure of the kidneys; yet, when it is safely lodged in the bladder, a part is re-absorbed, and the grosser excrementitious matter is alone thrown out. Something of the same kind happens in the perspiration of animals. They certainly take in something useful from the surface of their bodies; and this is probably performed by vessels opening outwards, different from the common exhalents. The great quantity of water, absorbed during the

use of the pediluvium, and that singular symptom in diabetes, or the patient's voiding a much greater quantity of urine than there is liquor taken in by the mouth, seem to confirm this assertion.

Plants are possessed of a power of forming their different parts and this is done by secretion. We may conjecture what the agents are which produce this effect, but in respect to the manner of their operation we are entirely in the dark. In animals, where the vital power is strong, this is the principal agent in producing the new arrangement of parts, which is made in every secretion; but in plants, where this power is weaker, it would be unequal to perform the function, if it were not assisted by absorption and fermentation. Wherever any firm matter is to be secreted, the vessels have a convoluted course, to allow the juice to be fermented, and the thinner parts to be absorbed. In this manner, the stones and kernels of fruits are supplied with nourishment by fibres, which are much convoluted. The proper juice seems to be formed only when the sap has ascended towards the leaves, and is descending towards the roots.

The pabula, from which vegetables receive the matter of secretion, are contained in the surrounding elements.

Some botanists have conceived, that plants, as well as animals, have a regular circulation of their fluids. Others think this very improbable. On both sides, recourse has been had to experiments; and from these, conclusions perfectly opposite have been deduced. When a ligature has been fixed round a tree, in such a manner that no juice could be transmitted through the bark, the tree has been found to thicken above the ligature; but below it to continue of the same circumference. Hence, some have concluded, that the sap ascends through the wood, and descends through the bark. Those who are of a contrary opinion have found that, in certain cases, the juice ascends through the bark only: for when a portion of the wood has been cut out, and the bark exactly replaced, the growth of the tree has been found to go on unchanged: hence it is said, that the juice is transmitted equally through all parts of vegetables. The analogy of animal nature appears to favour the opinion, that the juice rises through the wood only, and descends only through the bark: but this analogy is not complete throughout. The arteries are not placed in the internal parts alone, nor the veins in the external, but they accompany each other through every other part of their distribution.

In vegetables, the sap rises *from* the roots but the proper juice descends, *towards* them: in the descent of the juice, the

wood acquires its growth, and absorption is a constant action of the leaves. These observations render it probable, that there is a circulation of the juices; and if there be, the vessels which perform it, we may reasonably believe, accompany each other through every part of their course.

A perfect plant is composed of a root, of a stem with its branches, of leaves, flower, and fruit; for in Botany, by fruit, in herbs as well as in trees, we understand the whole fabric of the seed. But there is a principal part which requires an examination more at large; the *fructification*, that is, the *flower* and the *fruit*. For on this part Linnæus has founded his celebrated System of Botany. To understand this, take a lily, for instance. Before it opens, there is evidently, at the top of the stem, an oblong greenish bud, which grows whiter the nearer it is to opening; and when it is quite open, we perceive that the white cover takes the form of a basin, or vase, divided into several segments. This is called the *corolla*, and not the flower, as it is by the vulgar; because the flower is a composition of several parts, of which the corolla is only the principal.

The corolla of the lily is not of one piece. When it withers and falls, it separates into six distinct pieces, which are called *petals*. A corolla, consisting of several pieces like this, is called a *polypetalous* corolla. If it were all of one piece, like the bell-flower, or bind-weeds, it would be called *monopetalous*.

Exactly in the middle of the corolla is a sort of little column rising from the bottom, and pointing directly upwards. This, taken in its whole, is called the *pistil*, or *pointal:* taken in its parts, it is divided into three. 1. The swollen base, with three blunted angels, called the *germ*, or *ovary*. 2. A thread placed upon this, called the *style*. 3. The style crowned by a sort of capital, with three notches: this capital is called the *stigma*.

Between the pistil and the corolla of the lily, there are six other bodies, entirely separate from each other, which are called the stamens. Each stamen is composed of two parts one long and thin, by which it is fastened to the bottom of the corolla, and called the *filament;* the other thicker, placed at the top of the filament, and called *anthera*, or *anther*. Each anther is a box which opens when it is ripe, and throws out a yellow dust, which has a strong smell; this is called *pollen*, or *farina*.

Such is the general analysis of the parts which constitute a flower. As the corolla fades and falls, the germ increases, and becomes an oblong triangular capsule, within which are

flat seeds in three cells. This capsule, considered as the cover of the seeds, takes the name of *pericardium.*

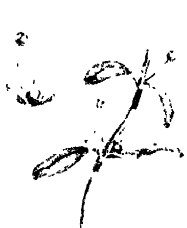
The parts here mentioned, are found in the flowers of most other plants, but in different proportion, situation, and number. By the analogy of these parts, and their different combinations, the families of the vegetable kingdom are determined; and these analogies are connected with others, in those parts of the plant which seem to have no relation to them. For instance, this number of six stamens, sometimes only three, of six petals or divisions of the corolla, and that triangular form of the germ, with its three cells, determine the lililaceous tribe; and in all this tribe, which is very numerous, the roots are *bulbs* of some sort or other. That of the lily is *squamous,* or composed of scales; in the ashpodel, it is a number of oblong solid bulbs, connected together; in the crocus and saffron there are two bulbs, one over the other; in the colchicum they are placed side by side.

The lily is deficient, however, in one of the constituent parts of a perfect flower, namely, the *calyx,* which is that outer green part of the flower, usually divided into five parts, or composed of five small leaves, sustaining and embracing the corolla at the bottom, and enveloping it entirely before it opens, as may be remarked in the rose. The calyx, which accompanies almost all other flowers, is wanting in the greater part of the lililaceous tribe; as the tulip, the hyacinth, the narcissus, the tuberose, &c. and even in the onion, leek, garlic, &c. which are also lililaceous, though they appear very different at first sight.

The Linnæan system of classing plants, is founded upon the supposition, that vegetables propagate their species in the same manner as animals.

The *stamina* he considers as the male, or fœcundating part, and the *pistil* as the female. In some species the male and female flowers are different; and in some, as the palm-tree, they grow upon different plants. But in the majority, the male and the female are found within the same *corolla,* and this large division of vegetables he styles *hermaphrodite* plants. On these principles Linnæus has arranged all the known genera of plants in twenty-five classes, and these again are sub-divided into orders. The genera are distinguished by attending to the other parts of the fructification; as the calyx, corolla, pericadrium, &c.

In the following table the classes are distinctly exhibited, with the orders into which each class is subdivided. In the botanical plates the classes are all expressed, and with each particular class some one of the orders which will easily serve to give the reader an idea of the rest.


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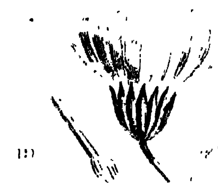

12

Botany














Botany

TABLE OF THE CLASSES AND ORDERS.

CLASSES.	ORDERS.
1. Monandria	1. Monogynia. 2. Digynia.
2. Diandria	1. Monogynia. 2. Digynia. 3. Trigynia.
3. Triandria	1. Monogynia. 2. Digynia. 3. Trigynia.
4. Tetrandria	1. Monogynia. 2. Digynia. 3. Tetragynia.
5. Pentrandria	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Tetragynia. 5. Pentagynia. 6. Polygnia.
6. Hexandria.	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Tetragynia. 5. Pologynia.
7. Heptandria	1. Monogynia. 2. Digynia. 3. Tetragynia. 4. Heptagynia.
8. Octandria	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Tetragynia.
9. Enneandria.	1. Monogynia. 2. Trigynia. 3. Hexagynia.
10. Decandria.	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Pentagynia. 5. Decagynia.
11. Dodecandria.	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Pentagynia. 5. Dodecagynia.
12. Icosandria.	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Pentagynia. 5. Polyginia.
13. Polyandria.	1. Monogynia. 2. Digynia. 3. Trigynia. 4. Tetragynia. 5. Pentagynia. 6. Hexagynia. 7. Polygynia.
14. Didygamia	1. Gymnospermia. 2. Angiospermia
15. Tetradynamia	1. Siliculosa. 2. Siliquosa.
16. Monadelphia.	1. Triandria. 2. Pentandria. 3. Octandria. 4. Enneandria. 5. Decandria. 6. Endecandria. 7. Dodecandria. 8. Polyandria.
17. Diadelphia.	1. Pentandria. 2. Hexandria. 3. Octandria. 4. Decandria.
18. Polyadelphia.	1. Pentandria. 2. Icosandria. 3. Polyandria.
19. Syngenesia.	1. Polygamia æqualis. 2. Polygamia superflua. 3. Polygamia frustranea. 4. Polygamia necessaria. 5. Polygamia segregata. 6. Monogamia.
20. Gynandria.	1. Diandria. 2. Triandria. Tetrandria. 4. Pentandria. 5. Hexandria. 6. Decandria. 7. Dodecandria. 8. Polyandria.
21. Monoecia.	1. Monandria. 2. Diandria. 3. Triandria. 4. Tetrandria. 5. Pentandria. 6. Hexandria. 7. Heptandria. 8. Polyandria 9. Monadelphia. 10. Syngenesia. 11. Gynandria.
22. Dioecia.	Monandria. 2. Diandria. 3. Triandria. 4. Tetrandria. 5. Pentandria. 6. Hexandria. 7. Octandria. 8. Enneandria. 9. Decandria. 10. Dodecandria. 11. Polyandria. 12. Monadelphia. 13. Syngenesia. 14. Gynandria.
23. Polygamia.	1. Minoecia. 2. Dioecia. 3. Trioecia.
24. Cryptogamia.	1 Filices. 2. Musci. 3. Algæ. 4. Fungi.
25.	1. Palmæ.

Explanation of the Botanical Plates.

Fig. I. Illustrates the class Monandria, and order Monogynia, one Stamen and one Pistil as in the Canna Indica, Indian Flowering Reed.

II. Monandria Monogynia, two Stamens and one Pistil, as in Veronica, or Speedwell.

III. Triandria, Digynia, three Stamens and two Stigmata, as in the Grasses, &c.

IV. Tetrandria, Monogynia, four Stamens and one Pistil, as in many examples.

V. Pentandria Monogynia, five Stamens and one Style or Pistil, as in the Henbane, &c.

VI. Hexandria Monogynia, six Stamens and one Style, as in Tradescantia Virginia, Spider-worst, &c.

VII. Heptandria Monogynia, seven Stamens and one Style.

VIII. Octandria Monogynia, eight Stamens and one Style, as in Erica, Heath, &c.

IX. Enneandria Monogynia, nine Stamens, &c.

X. Decandria Monogynia, ten Stamens and five Styles, as in Sedum, &c.

XI. Dodecandria Monogynia, twelve Stamens and one Pistil.

XII. Icosandria Polygynia, twenty Stamens arising from the substance of the Calyx or Corolla, with many Stigmata, as in Geum, Water Avens, &c.

XIII. Polyandria Monogynia, many Stamens with one Pistil or Style, as in Cistus, Poppy &c.

XIV. Didynamia, two Stamens longer than the other two, as in Lanuum, Archangel, &c.

XV. Tetradynamia, ——— six Stamens, four longer than the other two.

XVI. Monodelphia Pentagynia, many Stamens united at the base, and forming a cylinder with five Stigmata, as in Hibiscus, Syriacus, in the Mallow, &c.

XVII. Diadelphia, ——— the Stamens in two parcels, as in the Pea, &c.

XVIII. Polydelphia, ——— many sets of Stamens in one Flower.

XIX. Sygenesia, ——— Anthers united, as in Aster, Violet, &c.

XX. Gynandria, ——— Stamens connected to the Style, as in Sisyrinchium, &c.

XXI. Monoecia, ——— male and female flowers separate, but on the same plant.

XXII. Dioecia ——— Plants of this class are either male or female, each distinct, and bearing from a separate root.

XXIII. Polygamia. ——— Plants of this class bear hermaphrodite, together with distinct male and female flowers, or both.

XXIV. Cryptogamia. ——— Plants of this kind have a concealed fructification, as in the Fœlices, Ferns, &c.

Explanation of the Orders.

Class I. MONANDRIA. 2. DIANDRIA. 3. TRIANDRIA. 4. TETRANDRIA. 5. PENTANDRIA. 6. HEXANDRIA. 7. HEPTANDRIA. 8. OCTANDRIA. 9. ENNEANDRIA. 10. DECANDRIA.—These ten classes, which consist of hermaphrodite flowers, take their denominations from the number of Stamina, or male parts of the flower. The word here compounded with the numerical terms, signifies a husband; so that the title Monandria expresses that the flowers of this class have but one husband, that is, one Stamen; Diandria, two Stamina; Triandria, three; Tetrandria, four; Pentandria, five; Hexandria, six; Heptandria, seven; Octandria, eight; Enneandria, nine; and Decandria, ten. It must be observed, however, that the flowers being hermaphrodite, as above mentioned, is in all these classes a necessary condition; for should the female part be wanting, the plant would belong to some other class, notwithstanding the number of Stamina may be such as would otherwise refer it to one of these: and this caution we give once for all, to avoid repetitions, that when we use the term hermaphrodite, we mean that it is a condition not to be dispensed with.

CLASS XI. DODECANDRIA.—This term in the Greek imports that the flowers have twelve husbands or Stamina. However, the class is not confined to this number, but includes all such hermaphrodite flowers as are furnished with any number of Stamina from twelve to nineteen inclusive: no flowers have been yet found to have eleven Stamina, which is the reason no class has been allotted to that number.

CLASS XII. ICOSANDRIA.—This term imports, that the flowers have twenty husbands or Stamina: but here again the title is to be understood with great latitude; for though the plants that belong to this class are rarely found with less than twenty Stamina, yet they frequently have a greater number; and they are therefore not to be known with certainty from those of the next class, without having recourse to their classic character: which, not being expressed in the title, we forbear the explanation of here, as we shall give it in the section allotted for this class.

CLASS XIII. POLYANDRIA.—This term imports, that the flowers have many Stamina.

CLASS XIV. DIDYNAMIA.—This term signifies the power or superiority of two, and is applied to this class, because its flowers have four Stamina, of which there are two longer than the rest: this circumstance alone is sufficient to distinguish this class from the fourth, where the four Stamina are equal; but the flowers of this class have also their particular character, besides what the title expresses, their Corollæ being mostly ringent, as will be shewn in its place.

CLASS XV. TETRADYNAMIA.—This term expresses the power of superiority of four; and accordingly there are in the

flowers of this class six Stamina, four of which are longer than the rest; which circumstance distinguishes them from those of the sixth class, where the six Stamina are equal: but these flowers have their particular character also, their Corolla being cruciform.

CLASS XVI. MONODELPHIA.—The word here compounded with the numerical term, signifies a brother. This relation is employed to express the union of the filaments of the Stamina, which in this class do not stand separate, but join at the base, and form one substance, out of which they proceed as from a common mother; and the title of the class expresses a single brotherhood, meaning that there is but one set of Stamina so united, which distinguishes the class from the two following ones. The number of Stamina in this class is not limited: the flowers have their particular character.

CLASS XVII. DIADELPHIA.—This term expresses a double brotherhood, or two sets of Stamina, united in the manner explained in the preceding class. The number of the Stamina is not limited: the flowers of this class have a very particular character, their Corollæ being Papilionaceous, as will be shewn in its place.

CLASS XVIII. POLYADELPHIA.—This term expresses many brotherhoods, or sets of Stamina; the flowers have no classic character, farther than is expressed in the title.

CLASS XIX. SYNGENESIA.—This class contains the compound flowers described in Part I. Chap. 19. The title signifies congeneration, alluding to the circumstance of the Stamina; in which, though the filaments stand separate, yet the Antheræ, which are the parts more immediately subservient to generation, are united in a cylinder, and perform their office together. The classic character will be explained in its place.

CLASS XX. GYNANDRIA.—The term is compounded of two words, that signify wife and husband; and alludes to the singular circumstance of this class, in the flowers of which the Stamina grow upon the pistillum; so that the male and female parts are united, and do not stand separate, as in other hermaphrodite flowers.

CLASS XXI. MONOECIA.—The word here, compounded with the numerical term, signifies a house or habitation. To understand the application of this title, we must know, that the plants of this class are not hermaphrodite, but Androgynous, the flowers that have the Stamina wanting the Pistillum, and those that have the Pistillum wanting the Stamina. Now the term Monoecia, which signifies a single house, alludes to this circumstance; that in this class the male and female flowers are both found on the same plant, whereas in the next they have distinct habitations.

CLASS XXII. DIOECIA.—This term, which signifies two houses, is applied to this class (the plants of which are male and female) to express the circumstance of the male flowers being on one plant, and the female on another; the contrary of which is the case of the Androgynous class Monoecia, last explained.

CLASS XXIII. POLYGAMIA.—The term signifies plurality of marriages. This class produces, either upon the same or different plants, hermaphrodite flowers, and also flowers of one sex only, be it male or female; or flowers of each sex; and the latter receiving impregnation from, or giving it to the hermaphrodites, as their sex happens to be: the parts essential to generation in the hermaphrodite flowers do not confine themselves to the corresponding parts within the same flower, but become of promiscuous use: which is the reason of giving this title to the class.

CLASS XXIV. CRYPTOGAMIA.—The term signifies concealment of marriages; this class consisting of such plants as either bear their flowers concealed within the fruit, or have them so small, as to be imperceptible.

CLASS XXV. Palmæ, Palms.

Explanation of the TITLES *of the* ORDERS.

The titles of the orders have been already given. It remains therefore to explain them.

CLASS I. to XIII. inclusive.—The orders of the first thirteen classes take their denominations from the number of the Pistillum, or female part of the plant, which is usually reckoned from the base of the style, if there be any: but if the style be wanting, the number is fixed from the stigmata. The Greek word, compounded with the numerical term in the titles of these orders, signifies a wife: Monogynia implies one wife, or one style; Digynia, two styles; Trigynia, three; Tetragynia, four; Pentagynia, five; Hexagynia, six; Decagynia, ten; and Polygymia, many. These are the titles that occur in the orders of these thirteen classes: and this general explanation of them will be thought sufficient, as from the table it appears how they are employed in the classes.

CLASS XIV. DIDYNAMIA.—Of the three orders of this class the two first are founded on a distinction in the fruit. The title of the first order, Gymnospermia, is expressive of such plants as have naked seeds; and that of the second, Angiospermia, of such as have their seeds in a vessel or pericarpium. The third order, Polypetala, is expressive of such plants as have many petals: this order seems to have been established in favour of one genus of plants only, the Melianthus, the flowers of which are Polypetalous, though those of all the rest of this class are Monopetalous.

CLASS XV. TETRADYNAMIA.—The two orders of this class are founded on a distinction in the Pericarpium. In the first order, Siliculosa, the Pericarpium is a Silicula, little pod; which differs from the Siliqua or pod in being round, and having the apex of the dissepiment, which had been the style, prominent beyond the valves, often so far as to be equal in length to Silicula. In the second order, Siliquosa, the pericarpium is a Siliqua, which is long and without any remarkable extension of the style.

CLASS XVI. MONADELPHIA. XVII. DIADELPHIA.

XVIII. POLYADELPHIA.—The orders of these three classes are founded on the number of Stamina in each brotherhood, or distinct set of Stamina. The titles of the orders being the same that are used for the titles of the early classes of the system, the explanation need not be repeated here.

CLASS XIX. SYNGENESIA.—To understand the orders of this class, we must explain what is meant by polygamy in flowers. We have already treated of Polygamous plants, and shewn that the term Polygamous, as there applied, alluded to the intercommunication of the male or female flowers with the hermaphrodite ones, either upon the same, or a distinct plant: but in respect to flowers, the term is applied to a single flower only; for the flowers of this class being compound, a polygamy arises from the intercommunication of the several florets in one and the same flower. Now the polygamy of flowers, in this sense of the word, affords four cases, which are the foundations of the four first orders of this class. 1st order, polygamia æqualis, equal polygamy, is when all the florets are hermaphrodite. 2nd order, polygamia superflua, superfluous polygamy, when some of the florets are hermaphrodite, and others female only; for in this case, as the fructification is perfected in the hermaphrodites, the addition of the females is a superfluity. 3rd order, polygamia frustranea, frustraneous, or ineffectual polygamy, when some of the florets are hermaphrodite, and others neuter; for in this case the addition of the neuters is of no assistance to the fructification. 4th order, polygamia necessaria, necessary polygamy, when some of the florets are male, and the rest female; for in this case there being no hermaphrodites, the polygamy arising from the composition of the florets of different sexes is necessary to perfect the fructification. 5th order, polygamia segregata. The title signifies to be separated, the plants of this order having partial cups growing out of the common calyx, which surround and divide the flosculi or florets. 6th order, Monogamia: the title signifies a single marriage, and is opposed to the Polygamia of the four other orders; for in this, though the antheræ are united, which is the essential character of the flowers of this class, the flower is simple, and not compounded of many florets, as in the other orders.

CLASS XX. GYNANDRIA.—The orders of this class are founded on the number of Stamina. The titles have been already explained.

CLASS XXI. MONOECIA. XXII. DIOECIA.—These two classes, whose flowers have no fixed character but that of not being hermaphrodite, take in the characters of almost every other class; and the orders have accordingly been disposed under the titles of those classes, to which their respective flowers would have belonged, if the stamina and pistillum had been under the same covers. As the explanation of all these titles has been given in the last chapter, in the explanation of the classes, it need not be repeated here.

CLASS XXIII. POLYGAMIA.—In this class the titles of the two first orders are the same with the titles of the twenty-first and

twenty-second classes, and are to be understood in the same manner: that is, 1. Monoecia, when the polygamy is on the same plant: and, 2. Dioecia, when it is on distinct plants. The order Trioecia has been established in favour of a single genus, the Ficus; in which the polygamy is on three distinct plants, one producing male flowers, another female, and a third hermaphrodite, or androgynous.

CLASS XXIV. CRYPTOGAMIA.—The orders of this class are, 1. Filices, Ferns, 2. Musci, Mosses, 3. Algæ, Flags; and 4. Fungi, Mushrooms. The explanation of which will follow, when we treat of the genera.

The Genera of the Plants arranged according to the Classes and Orders.

Of the 1st CLASS, MONANDRIA.—This class consists of such plants as bear hermaphrodite flowers, furnished with but one Stamen. The orders are two, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains fourteen genera, distinguished into, 1. Trilocular, such as have the pericarpium divided into three Loculaments: of which there are eleven, viz. Canna, Indian flowering-reed, Ammomum, Ginger, Costus, Alpinia, Maranta, Indian arrow-root. Curcuma, Turmeric, Kæmpferia, Thalia, Myrosma, Phyllachne, and Renealmia. 2. Monospermous, such as have a single seed, of which there are three, viz. Boerhaavio, American hog-weed, Salicornia, Jointed glass-wort, and Hippuris.

ORDER II. DYGINIA, comprehending such plants as have two styles. This order contains five genera, viz, Corispermum, Tickseed, Callitriche, Star-headed water chick-weed, Blitum, Strawberry Spinach or Blite, Cinna, and Miniarum.

Of the 3rd CLASS, DIANDRIA.—This class consists of such plants as bear hermaphrodite flowers, furnished with two Stamina. The orders are three, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains thirty-one genera, distinguished into, 1. Such as have regular corallæ, of which there are eleven, viz. Nyctanthes, Arabian Jasmin, Jasminum, Jasmin, Ligustrum, Privet, Phillyrea, Mock privet, Olea, Olive, Chionanthus, Snow-drop tree, or Fringe tree, Syringa, Lilach, Dialum, Eranthemum, Circæa, Enchanters night-shade, and Wulfenia. 2. Such as have irregular corollæ, and the fruit Angiospermous;* of which there are ten, viz. Veronica. Speedwell, Pæderota, Justicia, Malabar nut, Dianthera, Gratiola, Hedge hyssop, Schwenkia, Pinguicula, Butter-wort, Utricularia, Watermilfoil, Calceolaria, and Globba. 3. Such as

* The seeds in a vessel. See the table explanatory of botanical terms, at the end of this class.

have irregular corolla, and the fruit Gymnospermous;* of which there are twelve, viz. Verbena, Vervain, Lycopus, Water hore-hound, Amethystea, Cunila, Ziziphora, Syrian field basil, Monarda, Oswego tea, Rosmarinus, Rosemary, Salvia, Sage, Collinsonia, Morina, Ancistrum, and Thouinia.

Order II. DYGINIA, comprehending such plants as have two styles. This order contains but one genus, viz. Anthoxanthum, Vernal grass.

Order III. TRYGINIA, comprehending such plants as have three styles. There is but one genus of this order, viz. Piper, Pepper.

Of the 3rd CLASS, TRIANDRIA. This class consists of such plants as bear hermaphrodite flowers, furnished with three Stamina. The orders are three, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. This order contains thirty-four genera, distinguished into, 1. Those whose flowers have no spatha or amentum; of which there are sixteen, viz. Valeriana, Valerian, Olax, Willichia, Tamarindus, Tamarind tree, Rumphia, Cneorum, Widow Wail, Comocladia, Melotheria, Small creeping Cucumber, Ortegia, Loeflingia, Polycnemum, Hippocratea, Rotala, Witsenia, Pommereulla, and Dilatris. Such as have spathaceous flowers, and a trilocular capsule; of which there are ten, viz. Crocus, Saffron, Ixia, Gladiolus, Corn flag, Antholyza, Iris, Flower de Luce, Moræa, Wachendorsia, Commelina, Callisia, and Xyris. 3. Such as have an imbricated amentum, and are Gymnospermous;† of which there are eight, viz. Schoenus, Bastard Cypress, Cyperus, English Galingale, Scirpus, Rush-grass, Eriophorum, Lygeum, Hooded Mat-weed, Nardus, Kyllinga, and Fuirena.

Order II. DIGYNIA, comprehending such plants as have two styles. This order contains thirty-one genera,‡ viz. Bobartia, Cornucopia, Saccharum, Sugar-cane, Panicum, Panic Grass, Phleum, Cat's-tail Grass, Alopecurus, Fox-tail Grass, Milium, Millet, Agrostis, Bent Grass, Aira, Hair Grass, Melica, Poa, Briza, Quaking Grass, Uniola, Sea-side Oats of Carolina, Dactylis, Cock's-foot Grass, Cynosurus, Dog's-tail Grass, Festuca, Fescu Grass, Bromus, Brome Grass, Stipa, Feather Grass, Avena, Oats, Lagurus, Hare's-tail Grass, Arundo, Reed, Aristida, Lolium, Darnel or Rye Grass, Elymus, Secale, Rye, Hordeum, Barley, Triticum, Wheat, Phalaris, Canary Grass, Paspalum, Rotthoella, and Anthistiria.

Order III. TRIGYNIA, comprehending such plants as have three styles. This order contains eleven genera, viz. Eriocaulon, Montia, Blinks, Proserpinaca, Triplaris, Holosteum, Polycarpon, Mollugo, Minuartia, Queria, Lechea, and Koenigia.

* The seeds naked.
† The seeds single and naked.
‡ All the plants of this order are grasses, the leaves of which are food for cattle, the small seeds for birds, and the larger grain for man.

Of the fourth class TETRANDRIA. This class consists of such plants as bear hermaphrodite flowers, furnished with four stamina. The flowers of this class may be known from those of the fourteenth by this distinction, that the stamina are of an equal length: whereas in those of the fourteenth, which have four stamina likewise, there are two long and two short. The orders of this class are three, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains seventy genera, distinguished into, 1. Such as have aggregate flowers, properly so called, with the seeds single and naked; of which there are seven, viz. Protea, Silver tree, Cephalanthus, Button Wood, Globularia, Blue Daisy, Dipsacus, Teazel, Knautia, Scabiosa, Scabious, and Allionia. 2. Such as have their flowers monopetalous on a double fruit, and the style bifid, of which there are twenty,* viz. Hedyotis, Spermacoce, Button Weed, Sherardia, Little Field Madder, Asperula, Woodroof, Diodia, Knoxia, Manettia, Houstonia, Galium, Lady's bed straw, Crucianella, Petty Madder, Rubia, Madder, Scabrita, Embothrium, Hydrophylax, Hartogia, Acaena, Bancksia, Orixa, Othera, and Skimmia. 3. Such as have monopetalous flowers otherwise circumstanced; of which there are twenty, viz. Siphonanthus, Catesbæa, Lily Thorn, Ixora, Pavetta, Petesia, Mitchella, Callicarpa, Johnsonia, Aquartia, Polypremum, Carolina Flax, Penæa, Blaeria, Buddleja, Exacum, Plantago, Plantain, Scoparia, Rhacoma, Centunculus, Sanguisorba, Greater Wild Burnet, Cissus, and Ægiphila. 4. Such as are tetrapetalous and complete:† of which there are twelve, viz. Epimedium, Barren Wort, Cornus, Dogwood or Cornelian Cherry, Fagara, Tomex, Amannia, Ptelea, Shrub Trefoil, Ludwigia, Oldenlandia, Isnardia, Santalum, Saunders, Trapa, Water Caltrops, and Samara. 5. Such as are incomplete;‡ of which there are eleven, viz. Dorstenia, Contrayerva, Elæagnus, Wild Olive, Crameria, Rivina, Sulvadora, Camphorosma, Alchemilla, Ladies' Mantle, Struthiola, Cometes, and Sirium.

ORDER II. DIGYNIA, comprehending such plants as have two styles. This order contains nine genera, viz. Aphanes, Parsley Piert, Cruzita, Bufonia, Hamamelis, Witch Mazel, Cuscuta, Dodder, Hypecoum, Galopina, Gomozia, and Gonocarpus.

ORDER III. TETRAGYNIA, comprehending such plants as have four styles. This order contains seven genera, viz. Ilex, Holley, Coldenia, Potamogiton, Pond Weed, Ruppia, Sagina, Purl-wort, Myginda, and Tillæa.

Of the fifth class, PENTANDRIA. This class consists of such plants as bear hermaphrodite flowers, furnished with five stamina. The orders are six, viz.

* These are Stellatæ, Starry Plants, of Ray. They are held to be astringent and diuretic.

† Not wanting either calyx or corolla.

‡ Calyx or corolla wanting.

ORDER I. MONOGYNIA, comprehending such plants as have but one style.* This order contains one hundred and fifty-five genera, distinguished into, 1. Monopetalous Tetraspermous,† of which there are sixteen,‡ viz. Heliotropium, Turn-sole, Myosotis, Mouse-ear, Scorpion Grass, Lithospermum, Gromwell, Anchusa, Bugloss, Cynoglossum, Hound's-tongue, Pulmonaria, Lungwort, Symphytum, Comphrey, Omnosma, Cerinthe, Honey-wort, Borago, Borrage, Asperugo, Wild Bugloss or Goose Grass, Lycopsis, Echium, Viper's Bugloss, Nolana, Tournefortia, and Messerschmidia. 2. Monopetalous with the capsule within the flower; of which there are thirty-five, viz. Diapensia, Arætia, Androsace, Primula, Primrose, Cortusa, Bear's ear Sanicle, Porana, Soldanel, Dodecatheon, Meadia, Cyclamen, Snow-bread, Menyanthes, Bog-bean, or Marsh Trefoil, Hottonea, Water Milfoil, or Water Violet, Hydrophyllum, Water-leaf Lysimachia, Loosestrife, Anagillis, Pimpernel, Theophrasta, Patagonula, Spigelia, Worm-grass, Ophiorrhiza, Serpent's Tongue, Randia, Axalea, American Upright Honeysuckle, Plumbago, Lead-wort, Phlox, Lichnidea, or Bastard Lochnis, Convolvulus, Bind-weed, Ipomea, Quamoclit, Lisianthus, Brossea, Allamanda, Polemonium, Greek Valerian, Nigrina, Retzia, Scheffieldia, Epacris, Doraena, Weigela, Tectona, and Ignatia. 3. Monopetalous with the Germen below the flower; of which there are thirty-one, viz. Campanula, Bell-flower, Roelle, Phyteuma, Rampious, Trachelium, Umbelliferous Throat-wort, Samolus, Round leaved Water Pimpernel, Nauclea, Rondeletia, Macrocnemum, Bellonia, Portlandia, Cinchona, Psychotria, Cofea, Coffee-tree, Chiococca, Cercpegia Lonicera, Honeysuckle, Triosteum, Fever-root, or false Ipecacuana, Morinda, Conocarpus, Button-tree, Hamellia, Erithalis, Menais, Genipa, Matthiala, Scævola, Mussænda, Virecta, Escallonia, Caroxylon, Elaedendrum, and Hovenia. 4. Such as have declining stamina; of which there are seven, viz, Mirabilis, Marvel of Peru, Coris, Heathlow Pine, Verbascum, Mullein, Datura, Thorn Apple, Hyocyamus, Henbane, Nicotiana, Tobacco, and Atropa, Deadly Nightshade. 5. Monopetalous, with a berry above the receptacle: of which there are twenty-two, viz. Physalis, Alkakingi, or Winter Cherry, Solanum, Nightshade, Capsicum, Guinea Pepper, Strychnus, Jacquinia, Chironia, Brunsfelsia, Cordia, Sibestan, Pergularia, Cestrum, Bastard Jasmin, Ebretia, Varronia, Laugieria, Lycium, Box-thorn, Chrysophyllum, Star-apple, Sideroxylum, Iron-wood, Rhamnus, Buckthorn, Arduina, Bastard Lycium, Ellisia, Phylica, Bastard Alaternus, Bladhia, and Fragraea. 6. Polypetalous, of which there are thirty-one, viz. Ceanothus, New Jersey Tea, Byttneria, Myrsine, African Box-tree, Celastrus, Staff-tree, Euonymus, Spindle-tree, Diosma, African Spirea, Brunia, Itea, Galax, Cedrela, Mangifera,

* The berries of the monopetalous plants of this order are for the most part poisonous.

† With four seeds.

‡ These are the Asperifolia, rough-leaved plants of Ray's History, page 487. They are accounted glutinous and vulnerary.

Mango-tree, Hirtella, Ribes, Currant-tree, Gronovia, Hedera, Ivy, Vitis, Vine, Lagoecia, Bastard Cumin, Sauvagesia, Claytonia, Achyranthes, Roridula, Kunbia, Pectronia, Cyrilla, Aquilicia, Heliconia, Carissa, Celosia, Cocks-comb, Colodendrum, Chenolea, and Corynocarpus. 7. Incomplete flowers, of which there are three, viz. Illecebrum, Mountain Knot-grass, Glaux, Sea Milkwort, or black Saltwort, and Thesium, Bastard Toad-flax. 8. Such as have the lobes of the corollæ bent obliquely to the right, of which there are nine, viz. Rauvolfia, Cerbera, Vinca, Perriwinkle, Gardenia, Cape Jasmin, Nerium, Oleander, or Rose-bay, Plumeria, Red Jasmin, Echites, Cameraria, and Tabernamontana.

Order II. DIGYNIA, comprehending such plants as have two styles. This order contains seventy-five genera, distinguished into, 1. Such as have the lobes of the corollæ bent obliquely to the right, of which there are six, viz. Periploca. Virginian Silk, Cynanchum, Apocynum, Dog's bane, Asclepis, Swallow-wort, Linconia, and Stapelia. 2. Monospermous;* of which there are ten, viz. Herniaria, Rupture-wort, Chenopodium, Goose-foot, or Wild Orache, Beta, Beet, Salsola, Glass-wort, Anabasis, Berry-bearing Glass-wort, Cressa, Gomphrena, Globe-amarant, Steris, Bosea, Yerva-mora, or Golden-rod Tree, and Ulmus, Elm-tree. 3. Polyspermous,† of which there are thirteen, viz. Nama, Hydrolea, Heuchera, Swertia, Marsh Gentium, Schrebera, Velezia, Gentiana, Gentian, or Fell wort, Bumalda, Coprosma, Cussonia, Melondinus, Russelia, and Vahlia. 4. Gymnodispermous,‡ with a simple umbel; of which there are three,§ viz. Phyllis, Bastard Hare's-ear, Eryngium, Eryngo, or Sea Holly, and Hydrocotyle, Water Navelwort. 5. Gymnodispermous with an universal and partial involucrum, of which there are twenty-seven, viz. Sanicula, Sanicle, Astrantia, Black Master-wort, Bupleurum, Hare's-ear, Echinophora, Prickly Parsnip, Tordylium, Hart-wort of Crete, Caucalis, Bastard Parsley, Artedia, Daucus, Carrot, Ammi, Bishop's-weed, Bunium, Pig-nut, or Earth-nut, Conium, Hemlock, Selinum, Milk Parsley, Athamanta, Spignel, Peucedanum, Hog's Fennel, or Sulphur-wort, Crithmum, Samphire, Hasselquistia, Cachrys, Ferula, Fennel-giant, Laserpitium, Laser-wort, Heracleum, Cow Parsnip, Ligusticum, Lavage, Angelica, Sium, Water Parsnip, Sison, Bastard Stone-Parsley, Bubon, Macedonian Parsley, Cuminum, Cumin, and Oenanthe, Water Dropwort. 6. Gymnodispermous, with only one partial umbel; of which there are eight, viz. Phellandrium, Cicuta, Water Hemlock, Æthusa, Lesser Hemlock, or Fool's Parsley, Coriandrum, Coriander, Scandix, Shepherd's Needle, or Venus's Comb, Chærophyllum, Wild Chervil, Imperatoria, Master-wort, and Sesseli, Hart-wort of Marseilles. 7. Gymnodispermous, without any involucrum, of

* Single seeded. † Many seeded ‡ Having two naked seeds.

§ These plants, and those of the two distinctions next following, which are Gymnodispermous also, are the Umbellate plants of Tournefort's seventh class. See his Institution, R. H. In dry soils they are aromatic, warm, resolvent, and carminative; but in moist places poisonous. The virtue is in the roots and seeds.

which there are eight, viz. Thapsia, Deadly Carrot, or Scorching Fennel, Pastinaca, Parsnip, Smyrnium, Alexanders, Anethum, Dill, Carum, Carrui, or Carraway, Pimpinella, Burnet Saxifrage, Apium, Parsley, and Ægopodium, Herb Gerrard, Gout-wort, or Wild Angelica.

ORDER III. TRIGYNIA, comprehending such plants as have three styles. This order contains seventeen genera, viz. Rhus, Sumach, Viburnunt, Pliant Mealy-tree, or Wayfaring-tree, Cassine, Hottentot Cherry, Sambucus, Elder, Spathelia, Staphylea, Bladder-nut, Tamarix, Tamarisk, Turnera, Telephium, True Orphine, Corrigiola, Pharnaceum, Alfine, Chickweed, Drypis, Basella, Malabar Nightshade, Sarothra, Bastard Gentian, Xylophylla, and Semecarpus.

ORDER IV. TETRAGYNIA, comprehending such plants as have four styles. This order contains two genera, viz. Parnassia, Grass of Parnassus, and Evolvulus.

ORDER V. PENTAGYNIA, comprehending such plants as have five styles. This order contains ten genera, viz. Aralia, Berry-bearing Angelicon, Mahernia, Statice, Thrist, or Sea Pink, Flax, Aldrovanda, Drosera, Sun Dew, Crassula, Lesser Orphine, Sibbaldia, Gisekia, and Commersonia.

ORDER VI. POLYGYNIA, comprehending such plants as have many style. This order contains but one genus, viz. Myosurus, Mouse-tail.

Of the sixth Class, HEXANDRIA.

This class consists of such plants as bear hermaphrodite flowers, furnished with six stamina. The flowers of this class may be known from those of the fifteenth, by this distinction, that the stamina are of equal length, whereas in those of the fifteenth, which have six stamina likewise, there are four long and two short. The orders of this class are five, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains sixty-two genera, distinguished into, 1, Such as have trifid corollæ, and a calyx, of which there are seven, viz. Bromelia, Ananas, or Pine-apple, Tillandsia, Burmannia, Tradescantia, Virginian Spider wort, Bursera, Licuala and Lachemalia. 2. Such as have monophyllous spatha, of which there are nine, viz. Pontederea, Hæmanthus, Blood-flower, Galanthus, Snow Drop, Leucojum, Greater Snow Drop, Tulbagia, Narcissus, Daffodil, Pancratium, Sea Daffodil, Duroia and Nandina. 3. Such as are hexapetalous and naked,* of which there are twenty-five, viz. Crinum, Asphodel-lilly, Amaryllis, Lily Daffodil, Bulbocodium, Aphyllanthes, Allium, Garlick, Lilium, Lily, Fritillaria, Frittillary, Uvularia, Gloriosa, Superb Silly, Tulip, Erythronium, Dog's-tooth Violet, Albuca, Ornithogalum, Star of Bethlehem, Scilla, Squill,

* Without a calyx. See the table at the end of this chapter, explanatory of the terms.

Hypoxis, Cyanella, Asphodelus, Asphodel, or King's Spear, Anthericum, Spider-wort, Leontice, Lion's Leaf, Dracena, Asparagus, of Speragc, Ehrharta, Massonia, Phormium, and Pollia. 4. Monopetalous and naked, of which there are ten, viz. Convallaria, Lily of the Valley, Polyanthes, Tuberose, Hyacinthus, Hyacinth, Aletris, Bastard Aloe, Yucca, Adam's Needle, Aloe, Agave, American Aloe, Alstromeria, Capura, and Hemerocallis, Day-lily, or Lillyasphodel. 5. Such as have a calyx, but the corolla not trifid; of which there are thirteen, viz. Acorus, Sweet Rush, Orontium, Floating Arum, Calamus, Juncus, Rush, Achras, Sapota, Richardia, Prinos, Winterberry, Berberis, Berberry, or Piperage Bush, Loranthus, Frankenia, Hillia, Peplis, Water Purslane, and Canaria.

Order II. DIGYNIA, comprehending such plants as have two styles. This order contains four genera, viz. Atraphaxis, Oryza, Rice, Falkia, and Gahnia.

Order III. TRIGYNIA, comprehending such plants as have three styles. This order contains ten genera, viz. Flagelleria, Rumex, Dock, Scheuchzeria, Lesser Flowering-rush, Triglochin, Arrow-headed Grass, Melanthium, Climbing African Asparagus, Medeola, Trillium, Herb True-love of Canada, Colchicum, Meadow Saffron, Helonias, and Wurmbea.

Order IV. TETRAGYNIA, comprehending such plants as have four styles. Of this order there is but one genus, viz. Petiveria, Guinea-hen Weed.

Order V. POLYGNIA, comprehending such plants as have many styles. Of this order there is but one genus, viz. Alisma, Water Plaintain.

Of the seventh Class, Heptandria.

This class consists of such plants as bear hermaphrodite flowers, furnished with seven stamina. The orders of this class are four, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. This order contains three genera, viz. Trientalis, Winter Green, with Chick-weed Flowers, Disandra, and Æsculus, Horse-chesnut.

Order II. DIGYNIA, comprehending such plants as have two styles. This order contains but one genus, viz. Limeum.

Order III. TETRAGYNIA, comprehending such plants as have four styles. Of this order there are but two genera, viz. Saururus, Lizard's Tail, and Aponogeton.

Order IV. HEPTAGYNIA, containing such plants as have seven styles. Of this order there is but one genus, viz. Septas.

Of the eighth Class, Octandria.

This class consists of such plants as bear hermaphrodite flowers, furnished with eight stamina. The orders are four, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. Of this order there are thirty-one genera, viz.

Tropæolum, Indian Cress, Osbeckia, Rhexia, Oenothera, Tree Primrose, Gaura, Virginian Loosestrife, Epilobium, Willow Herb, or French Willow, Melococca, Grislea, Amyris, Allophyllus, Combretom, Fuschia, Ximenia, Mimusops, Jambolifera, Mcmecylon, Lawsonia, Vaccinium, Whortle-berry, Erica, Heath, Daphne, Mezereon, or Spurge-laurel, Dirca, Leather-wood, Gnidia, Stellera, German Groundsel, Passerina, Sparrow-wort, Lachnæa, Antichorus, Chlora, Dodonæa, Ophira, Guarea, and Bæckea.

Order II. DIGYNIA, comprehending such plants as have two styles. This order contains five genera, viz. Galenia, Weinmannia, Moehringia, Mountain Chickweed, Schmidelia, and Codia.

Order III. TRIGYNIA, comprehending such plants as have three styles. This order contains five genera, viz. Polygonum, Knot Grass, Coccoloba, Paullinia, Cardiospermum, Heart Pea, and Sapindus, Soap-berry.

Order IV. TETRAGYNIA, comprehending such plants as have four styles. This order contains four genera, viz. Paris Herb True-love, or Oneberry, Adoxa, Tuberous Moschatel, or Hollow Root, Elatine, Water-wort, and Haloragis.

Of the ninth Class, Enneandria.

This class consists of such plants as bear hermaphrodite flowers, furnished with nine stamina. The orders are three, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. This order contains four genera, viz. Lauris, Bay, Tinus, Anacardium, Cashew-nut, and Cassyta.

Order II. TETRAGYNIA, comprehending such plants as have three styles. This order contains but one genus, viz. Rheum, Rhubarb.

Order III. HEXAGYNIA, comprehending such plants as have six styles. Of this order there is but one genus, viz. Butomus, Flowering Rush, or Water Gladiolus.

Of the tenth Class, Decandria.

This class consists of such plants as bear hermaphrodite flowers, furnished with ten stamina. The orders are five, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. This order contains fifty-six genera, distinguished into, I. Such as have declined stamina, of which there are fifteen, viz. Sophora, Anagyris, Stinking Bean Trefoil, Cercis, Judas Tree, Bauhinia, Mountain Ebony, Parkinsonia, Hymenæa, Locust-tree, or Courbaril, Cassia, Wild Senna, Poinciana, Barbadoes Flower-fence, Cæsalpinia, Brasilletto, Guilandina, Bardue, or Nichar, Tree, Guaiacum, Lignum Vitæ, Cynometra, Anacardium, Cashew-nut, Swietenia, Mahogany Tree, and Dictamnus. 2. Such as have erect stamina, of which there are forty-one, viz. Ruta, Rue, Toluifera,

Balsam of Tolu Tree, Hæmatoxylum, Logwood, Adenanthera, Bastard flower-fence, Melia, Bread-tree, Trichilia, Zygophyllum, Bean-caper, Quassia, Fagonia, Tribulus, Caltrops, Thryallis, Murraya, Monotropa, Jussiena, Limonia, Melastoma, American Goose-berry, Kalmia, Dwarf American Laurel, Ledum, Marsh Cistus, or Wild Rosemary, Quisqualis, Dais, Bergera, Bucida, Copaifera, Samyda, Rhododendron, Dwarf Rose-bay, Andromeda, Marsh Cistus, Epigæa, Trailing Arbutus, Gualtheria, Arbutus, Strawberry-tree, Clethra, Pyrola, Winter-green, Prosopis, Heisteria, Chalcas, Codon, Styrax, Storax-tree, Turræa, Dionæa, Venus's Fly-trap, Ekebergia, Inocarpus, and Myroxylon.

Order II. DIGYNIA, comprehending such plants as have two styles. Of this order there are twelve genera, viz. Royena, African Bladder-nut, Hydrangea, Cunonia, Chrysosplenium, Golden Saxifrage, Saxifraga, Saxifrage, Tiarella, Metella, Bastard American Sanicle, Scleranthus, German Knot-grass, or Knawel, Trianthema, Gypsophila, Saponaria, and Dianthus.

Order III. TRIGYNIA, comprehending such plants as have three styles. Of this order there are twelve genera, viz. Cucubalus, Berry-bearing Chick-weed, Sileno, Viscous Campion, Stellaria, Great Chickweed, Arenaria, Sea Chick-weed, Chereria, Fennel Flower of Crete, Malpiphia, Barbadoes Cherry, Banisteria, Triopteris, Erythroxylon, Hiræa, and Deutzia.

Order IV. PENTAGYNIA, comprehending such plants as have five styles. Of this order there are fourteen genera, viz. Averrhoa, Spondias, Brasilian Plum, Cotyledon, Navel-wort, Sedum, Lesser Houseleek, Penthorum, Oxalis, Wood Sorrel, Suriana, Lychnis, Campion, Agrostema, Campion, or Wild Lichnis, Cerastium, Mouse-ear Chickweed, Spergula, Spurray, Grielum, Forskoblea, and Bergia.

Order V. DECAGYNIA, comprehending such plants as have ten styles. This order contains two genera, viz. Neurada, and Phytolocca, American Night-shade.

Of the eleventh Class, Dodecandria.

This class, notwithstanding its title, which is expressive of twelve stamina, consists of such plants as bear hermaphrodite flowers, furnished with any number of stamina from twelve to nineteen inclusive.* The orders are five, viz.

Order I. MONOGYNIA, comprehending such plants as have but one style. This order contains twenty-five genera, viz. Asarum, Asarabacca, Gethyllis, Bocconia, Rizophora, Candle of the Indians, Blakea, Garcinia, Winterana, Cratæva, Garlick Pear, Triumfetta, Bassia, Peganum, Wild Syrian Rue, Halesia, Nitraria, Portulaca,

* Tormentilla is an exception, belonging to the next class, though it has but sixteen stamina. The characters of the fructification in the next class over-rule the number of the male part expressed in its title.

Purslane, Hudsonia, Lythrum, Willow Herb, Ginora, Decumaria, Befaria, Vatica, Apastis, Conella, Dodecas, Eurya, and Aristotelia.

ORDER II. DIGYNIA, comprehending such plants as have two styles. Of this order there are two genera, viz. Heliocarpus, and Agrimonia, Agrimony.

ORDER III. TRIGYNIA, comprehending such plants as have three styles. This order contains five genera, viz. Reseda, Bastard Rocket, Euphorbia, Burning Thorny Plant, or Spurge, Pallasia, Tacca, and Visnea.

ORDER IV. PENTAGYNIA, comprehending such plants as have five styles. This order contains but one genus, viz. Glinus.

ORDER V. DODECAGYNIA, comprehending such plants as have twelve styles. This order contains but one genus, viz. Sempervivum, Houseleek.

Of the twelfth Class, ICOSANDRIA.*

This class consists of such plants as bear hermaphrodite flowers, of the following characters, viz. 1. A calyx monophyllous, and concave. 2. The corolla fastened by its claws to the inner side of the calyx. 3. The stamina twenty or more. As the number of stamina in this class, notwithstanding its title, is not limited, an attention must be had to the two first characters, to distinguish the flowers from those of the next class, with which they might otherwise be confounded. The orders are five, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains eleven genera, viz. Cactus, Melon, Thistle, Eugenia, Philadelphus, Mock Orange, Psidium, Guayava, or Bay Plum, Myrtus, Myrtlé, Punica, Pomegranate, Amygdalus, Amygdalus, Prunus, Plum Tree, Plinia, Chrysobalanus Cocoa Plum, and Sonneratia.

ORDER II. DIGYNIA, comprehending such plants as have two styles. Of this order there is but one genus, viz. Cratægue, Wild Service.

ORDER III. TRIGYNIA, comprehending such plants as have three styles. This order contains two genera, viz. Sorbus, Service Tree, and Sesuvium.

ORDER IV. PENTAGYNIA, comprehending such plants as have five styles. This order contains six genera, viz. Mespilus, Medlar, Pyrus, Pear, Tetragonia, Mesembryanthemum, Fig Marygold, Aizoon, and Spiræa.

ORDER V. POLYGYNIA, comprehending such plants as have many styles. This order contains nine genera, viz. Rosa, Rose, Robus, Raspberry, Fragaria, Strawberry, Potentilla, Cinquefoil, Tormentilla, Tormentil, Geum, Avens, or Herb Bennet, Dryas, Comorum, Marsh Cinquefoil, and Calycanthus, Virginian All-spice.

* This class furnishes the fruits most in esteem.

Of the thirteenth Class, POLYANDRIA.*

This class consists of such plants as bear hermaphrodite flowers, furnished with many stamina. The distinction between this class and the twelfth may be known by having recourse to the characters of the twelfth class in the preceding chapter. The orders are seven, viz.

ORDER I. MONOGYNIA, comprehending such plants as have but one style. This order contains forty-two genera, distinguished into, 1. Such as have scarce any style, of which there are thirteen, viz. Marcgravia, Rheedia, Capparis,† Caper Bush, Actæa, Herb Christopher, Sanguinaria, Puccoon, Podophyllum, Duck's foot, or May-apple, Chelidonium, Celandine, Papaver, Poppy, Argemone, Prickly Poppy, Muntingia, Cambogia, Sarracena, Side-saddle flower, and Nymphæa, Water Lily. 2. Such as have a style of some length, of which there are twenty-nine, viz. Bixa, Anotta, Sloanea, Aperba, of the Brasilians, Mammea, Mammee, Ochna, Calophyllum, Grias, Tilia, Lime Tree, Laetia, Elæocarpus, Lechythis, Vateria, Lagerstroemia, Thea, Tea-tree, Caryophyllus, Clove Tree, Mentzelia, Delima, Cistus, Rock Rose, Prockia, Corchorus, Jew's Mallow, Seguieria, Loosa,' Trewia, Trilix, Alstonia, Cleyera, Myristica, Sparrmania, Ternstromia, and Vallea.

ORDER II. DIGYNIA, comprehending such plants as have two styles. This order contains four genera, viz. Pæony, Pœona, Calligonum, Curatella, and Fothergilla.

ORDER III. TRIGYNIA, comprehending such plants as have three styles. This order contains two genera, viz. Delphinium Larkspur, and Aconitum, Wolf's-bane.

ORDER IV. TETRAGYNIA, comprehending such plants as have four styles. This order contains three genera, viz. Tetracera, Caryocar, and Cimicifuga.

ORDER V. PENTAGYNIA, comprehending such plants as have five styles. This order contains four genera, viz. Aquilegia, Columbine, Nigella, Fennel Flower, or devil in a bush, Reaumuria and Brathys.

ORDER VI. HEXAGYNIA, comprehending such plants as have six styles. This order contains but one genus, viz. Stratiotes, Water Soldier.

ORDER VII. POLYGYNIA, comprehending such plants as have many styles. This order contains twenty-one genera, viz. Dillenia, Liriodendron, Tulip-tree, Magnolia, Laurel leaved Tulip-tree, Michelia, Uvaria, Annona, Custard Apple, Anemone, Wind flower, Atragene, Clematis, Virgin's Bower, Thalictrum, Meadow Rue,

* The fruits of this class are often poisonous; which makes it necessary to distinguish them from those of the last, which abounds with eatable fruits.

† Capparis has some length of style.

. Adonis, Bird's eye, Illicium, Ranunculus, Crow-foot, Trollius, Globe Ranunculus, Isopyrum, Helleburus, Black Hellebore, Caltha, Marsh Marygold, Hydrastis, Yellow Root, Houtuynia, Unona, and Wintera.

Of the fourteenth Class, DIDYNAMIA.

This class consists of such plants as bear hermaphrodite flowers, furnished with four stamina; two of which are longer than the rest. This circumstance would suffice to distinguish it from the fourth class, in which the four stamina are equal: however, as the flowers of this class have a particular structure, there are general characters which will nearly serve for the whole class; and these we will give at length.

Characters of the Class, DIDYNAMIA.

CALYX.—A perianthum, monophyllous, erect, tubulate, quinquefid, with segments for the most part unequal, and persisting.

COROLLA.—Monopetalous and erect, the base of which contains the honey, and does the office of a nectarium. The upper lip straight: the lower spreading and trifid. The middle lacinia the broadest.

STAMINA.—Four filaments, subulate, inserted in the tube of the corolla, and inclined towards the back thereof. The two inner and nearest the shortest. All of them parallel, and rarely exceeding the length of the corolla. The antheræ lodged under the upper lip of the corolla in pairs; in each of which respectively the two antheræ approach each other.

PISTILLUM.—The germen commonly above the receptacle. The style single, filiform, bent in the same form as the filaments, usually placed within them, a little exceeding them in length, and slightly curved towards the summit. The stigma for the most part emarginate.

PERICARPIUM.—Either wanting (see the first order) or, if present, usually bilocular (see the second order).

SEEDS.—If no pericarpium, four, lodged within the hollow of the calyx, as in a capsule; but if there be a pericarpium, more numerous, and fastened to a receptacle placed in the middle of the pericarpium.

The flowers of this class are for the most part almost upright. but inclining a little to an acute angle from the stem, that the corolla may more easily cover the antheræ, and that the pollen may fall on the stigma, and not be soaked with the rain. The essential character is in the four stamina; of which the two nearest are shorter, and all four close to each other, and transmitted with the single style of the pistillum through a corolla that is unequal.

The orders of this class are two, viz

ORDER I. GYMNOSPERMIA,* comprehending such plants as have naked seeds. This order has these farther characters, viz. the seeds four (excepting Phryma, which is monospermous): and the stigma bipartite, and acute, with the lower lacinia reflexed. It contains thirty-four genera, distinguished into, 1. Such as have the calyx quinquefid, and nearly equal, of which there are twenty, viz. Ajuga, Bugle, Teucrium, Germander, Satureja, Savory, Thymbra, Mountain Hyssop, Hyssopus, Hyssop, Nepeta, Catmint, or Nep, Lavandula, Lavender, Betonica, Betony, Sideritis, Iron-wort, Mentha, Mint, Glechoma, Ground-ivy, or Gill, Perilla, Lamium, Dead Nettle, or Archangel, Galeopsis, Hedge Nettle, Stachys, Base Horehound, Ballota, Black Horehound, Marribium, Horehound Leonurus, Lion's-tail, Phlolmis Jerusalem Sage, and Moluccella, Molucca Baum. 2. Such as have the calyx bilabiate, divided into two lips: of which there are fourteen, viz. Clinopodium, Field Basil, Origanum, Wild Marjorum, Thymus, Thyme, Melissa, Baum, Dracocephalon, Dragon's Head, Horminum, Pyrenæan Clary, Melittis, Baum-leaved Archangel, or Bastard Baum, Ocymum, Basil, Trichostema, Scutellaria, Skull-cap, Prunella, Self-heal, Cleonia, Prasium, Shrubby Hedge-nettle, and Phryma.

ORDER II. ANGIOSPERMIA,† comprehending such plants as have the seeds in a pericarpium, which circumstance is constant, and distinguishes this order from the last in every form. To this character may be added that of a stigma, commonly obtuse. This order contains sixty-nine genera, distinguished into, 1. Such as have a simple stigma, and personate corollæ; of which there are thirteen, viz. Bartsia, Rhinanthus, Elephant's Head, Euphrasia, Eye-bright, Melampyrum, Cow-wheat, Lathræa, Schwalbea, Tozzia, Pedicularis, Rattle Coxcomb, or Louse-wort, Gerardia, Chelone, Gesneria, Antirrhinum, Snap Dragon, or Calves Snout, and Cymbaria. 2. A simple stigma and spreading corollæ, of which there are thirty, viz. Craniolaria, Martynia, Torenia, Scrophularia, Fig-wort, Celsia, Digitalis, Fox-glove, Bignonia, Trumpet Flower, Citharexylum, Fiddle-wood, Halleria, African Fly-honey-suckle, Crescentia, Calabash Tree Gmelina, Petrea, Lantana, American Viburnum, Cornutia, Loeselia. Capraria, Selago, Hebenstretia, Erinus, Buchnera, Browallia, Linnæa, Sibthorpia, Limosella, Least Water Plantain, Hemimeris-Dombeya, Castilleja Millingtonia, Thunbergia, and Amasonia. 3. With a double stigma; of which there are twenty-five, viz. Stemodia, Obolaria, Orobanche, Brown Rape, Dodartia, Lippia Sesamum, Oily Purging-grain, Mimulus, Monkey Flower, Ruellia, Barleria Duranta, Ovieda, Volkameria, Clerodendrom, Vitex, Agnus Castus, or Chaste Tree, Bontia, Columnea, Acanthus, Bear's Breech, Pedalium, Avicennia, Vandelia, Manulea, Besteria, Lindernia,

* The plants of this order are scented and are accounted cephalic and resolvent. The virtue is in the leaves. They are the Labiati (lipped plants) of Tournefort, and Verticilati (plants that flower at the joints) of Ray's Hist. Plant. 508.

† These are the personati, personate flowers of Tournefort.

Premna, and Hyobanche, 4. Such as have many petals, of which there is but one genus, viz. Melianthus, Honey Flower.

Of the fifteenth Class, Tetradynamia.*

This class consists of such plants as bear hermaphrodite flowers, furnished with six stamina, two of which are shorter than the rest, by which last circumstance it may be distinguished from the sixth class, whose flowers have six equal stamina. The flowers of this class are of a particular structure, answering to the characters following.

Characters of the Class Tetradynamia.

CALYX,—A perianthium tetraphyllous, and oblong; the leaves of which are ovato-oblong, concave, obtuse, conniving, gibbous downwards at the base, the opposite ones equal and deciduous. The calyx in these flowers is a nectarium; which is the reason of the base being gibbous.

COROLLA.—Called cruciform. Four equal petals. The claws plano-subulate, erect, and somewhat longer than the calyx. The limb plane. The laminæ widening outwards, obtuse, the sides hardly touching one another. The insertion of the petals is in the same circle with the stamina.

STAMINA.—The filaments six, and subulate; of which two that are opposite are of the length of the calyx; the other four somewhat longer, but not so long as the corolla. The antheræ oblong, acuminate, thicker at the base, erect, and with the tops leaning outwards. There is a nectariferous glandule, which in the different genera has various appearances; it is seated close to the stamina, and particularly to the two shorter ones, to whose base it is fastened; and these have a light curvature to prevent their pressing upon it, whereby those filaments become shorter than the rest.

PISTILLUM.—The germen above the receptacle, increasing daily in height. The style either of the length of the longer stamina or wanting. The stigma obtuse.

PERICARPIUM.—A siliqua of two valves, often bilocular, opening from the base to the top. The dissepiment projecting at the top beyond the valves, the prominent part thereof having before served as a style.

SEEDS.—Roundish, inclining downwards, alternately plunged

* These are the Cruciformes (cross-shaped flowers) of Tournefort, and this Silipuosæ, and the Siliquosæ (plants that have pods) of Ray's Hist. Plant. 777. This class is truly natural, and has been assumed as such by all systematists, though individuals have often added one or more genera to it, contrary to nature. Linnæus thinks he has given no wrong one, unless it be Cleome. The distinction into Siliculose, and Siliquose, is admitted by all. The plants are held to be antiscorbutic and diuretic. The taste in most is watery mixed with a sharpness. They commonly lose their quality when dried. The essential character of the several genera in this class depends commonly on the situation of the nectariferous glandule.

lengthwise into the dissepiment. The receptacle linear, surrounding the dissepiment, and immersed in the sutures of the pericarpium. The orders are two, viz.

ORDER I. SILICULOSA, comprehending those plants whose pericarpium is a silicula. This order contains fourteen genera, viz. Myagrum, Gold of pleasure, Vella, Spanish Cress, Anastatica, Rose of Jericho, Subularia, Rough-leaved Alysson, Draba, Whitlow Grass, Lepidium, Dittander, or Pepper-wort, Thlaspi, Mithridate Mustard, or Treacle Mustard, Cocklearia, Scurvy-grass, or Spoon-wort, Iberis, Candy-tuft, or Sciatic Cress, Alyssum, Mad-wort, Peltaria, Clypeola, Treacle Mustard, Biscutella, Buckler Mustard, and Lunaria, Moon-wort, Satin Flower, or Honesty.

ORDER II. SILIQUOSA, comprehending those plants whose pericarpium is a siliqua.* This order contains eighteen genera, viz. Ricotia, Dentaria, Tooth-wort, Cardamine, Lady's Smock, Sisymbrium. Sisymbrium, Erysimum, Hedge Mustard, Cheiranthus, Stock July-flower, Heliophola, Hesperis, Dames Violet, Rocket, or Queen's July-flower, Arabis, Bastard Tower Mustard, Turritis, Tower Mustard, Brassica, Cabbage, Sinapis, Mugtard, Raphames, Raddish Bunias, Isatis, Woad, Crambe, Sea-cabbage, Cleome, Bastard Mustard, and Chamira.

Of the sixteenth Class, MONODELPHIA.

This class consists of such plants as bear hermaphrodite flowers, furnished with one set of united stamina. This class consists of eight orders. The characters of the flowers are as follows.

Characters of the Class MONODELPHIA.

CALYX.—A perianthum always present, persisting, and in most genera double.

COROLLA.—Pentapetalous, the petals heart-shaped; the sides of which lap each one over the next, contrary to the motions of the sun.

STAMINA.—The filaments united below, but distinct upwards if there be more than one.† The exterior ones shorter than the interior. The antheræ incumbent.

PISTILLUM.—The receptacle of the fructification prominent in the centre of the flower. The germen erect, surrounding the top of the receptacle in a jointed ring. The styles are all united below in one substance with the receptacle; but divided above into as many threads as there are germen. The stigma spreading and thin.

PERICARPIUM.—A capsule divided into as many loculaments as there are pistilla. Its figure various in the different genera.

SEEDS.—Kidney-shaped.

* See the table of botanical terms at the end of the chapter.

† In this class the calyx is of great moment, for distinguishing the genera, and fixes the limits with certainty. They were formerly distinguished by the fruit; which not being found sufficient, recourse was had to the leaves of the plant. The plants of this class are esteemed to be excellent, and mulilleginous.

The corolla in this class has been called monopetalous; but as the petals are all distinct at the base, it is to be styled more properly pentapetalous, notwithstanding the petals cohere by the union of the stamina. The orders are eight, viz.

ORDER I. TRIANDRIA, comprehending such plants as have three stamina. This order contains three genera, viz. Aphyteja, Galaxia, and Hydnora.

ORDER II. PENTANDRIA, comprehending such plants as have five stamina. This order contains five genera, viz. Waltheria. Lerchea, Hermannia, Melochia, and Symphonia.

ORDER III. OCTANDRIA, comprehending such plants as have eight stamina. Of this order there is but one genus, viz. Aitonia.

ORDER IV. ENNEANDRIA, comprehending such plants as have nine stamina. Of this order there is but one genus, viz. Dryandra.

ORDER V. DECANDRIA, comprehending such plants as have ten stamina. This order contains three genera, viz. Conarus, Geranium,* and Hugonia.

ORDER VI. ENDECANDRIA, comprehending such plants as have eleven stamina. Of this order there is only one genus, viz. Brownea.

ORDER VII. DODECANDRIA, comprehending such plants as have twelve stamina. This order contains only one genus, viz. Pentapetes.

ORDER VIII. POLYANDRIA, comprehending such plants as have many stamina. This order contains twenty-one genera, viz. Bombax, Silk Cotton-tree, Sida, Indian Mallow, Adansonia, Æthyopean Sower Gourd, Althæa, Marsh Mallow, Alcea, Holly-hock, or Rose Mallow, Malva, Mallow, Lavatera, Malope, Bastard Mallow, Urena, Indian Mallow, Gossypium, Cotton, Hibiscus, Althea Frutex, or Syrian Mallow, Stewartia, Camellia, Morisonia, Mesua, Indian Rose-chesnut, Malachra, Gordonia, Gustavea, Corolinea, Barringtonia, and Solandra.

Of the seventeenth Class, DIADELPHIA.

This class consists of such plants as bear hermaphrodite flowers, furnished with sets of united stamina. The characters of the fructification are as follow.

Characters of the Class DIADELPHIA.

CALYX.—A perianthium monophyllous, campanulate, and withering. The base gibbous the lower part thereof fastened to the

* The species of this genus varies singularly in the number of stamina and other circumstances, viz. from 1—22 they have seven fertile stamina, the leaves alternate, and many flowers on a peduncle; from 23—35 they have seven fertile stamina, and the leaves growing opposite; from 36—45 five fertile stamina, the calyx five leaves, and the fruit declined; from 46—58 ten fertile stamina, and the two flowers on a peduncle; from 59—68 ten fertile stamina, two flowers on a peduncle, and the plants annual; from 69—82 ten fertile stamina, and one flower on a peduncle.

peduncle, the upper obtuse and melliferous. The brim quinquedentate, acute, erect, oblique, unequal. The lowest odd denticle longer than the rest; the upper pair shorter and farther asunder. The bottom of the cavity moist with a melleous liquor, including the receptacle.

COROLLA.—Termed papilionaceous, unequal; the petals expressed by distinct names, viz.

Vexillum, the standard; a petal covering the incumbent, greater, plano-horizontal, inserted by its claw in the upper margin of the receptacle, approaching to a circular figure when it leaves the calyx, and nearly entire; along it, and especially towards the extremity, runs a line, or ridge, that rises up, as if the lower part of the petal had been compressed; the part of the petal next to the base approaching to a semicylindric figure, embraces the parts that lie under it. The disk of the petal is depressed on each side, but the sides of it nearest the margin are reflexed upwards. Where the halved tube ends, and the halved limb begins to unfold itself, are two concave impressions prominent underneath, and compressing the wings, that lie under them.

Alæ, the wings, two equal petals, one at each side of the flower, placed under the vexillum; incumbent with their margins parallel, roundish, or oblong, broader upwards, the upper margin straighter, the lower spreading more into a roundness; the base of each wing bifid, the lower division stretching out into a claw, inserted in the side of the receptacle, and about the length of the calyx; the upper shorter and inflexed.

Carina, the keel, the lowest petal, often bipartite, placed under the vexillum and between the alæ; boat-shaped, concave, compressed on the sides, set like a vessel afloat, mutilate at the base, the lower part of which runs into a claw of the length of the calyx, and inserted in the receptacle, but the upper and side laciniæ are interwoven with that part of the alæ that is of the same shape. The form of the sides of the carina, is much like that of the alæ: and so also is their situation, except that they are lower, and stand within them. The line that forms the carina, or keel, in this petal, runs straight as far as the middle, and then rises gradually in the segment of a circle, but the marginal line runs straight to the extremity, where meeting the carinal, they terminate obtusely.

STAMINA.—Called Diadelphia. The filaments two, of different forms, viz. a lower one that involves the pistillum, and an upper one incumbent on it. The former of these, from the middle downwards, is cylindraceous, membranaceous, and split lengthwise on its upper side; but the upper half terminates in nine subulate* parts, that are of the same length with, and follow the flexure of the carina of the corolla, and of which the immediate or lower radii† are longer by alternate pairs. The upper filament is subularo-setose,‡ covering

* Awl-shaped.
† Rays, meaning the divisions of the filaments.
‡ Awl-shaped, and like a bristle.

the splitting of the former cylindraceous filament, incumbent on it, answering to it in situation, simple and gradually shorter; its base is detached from the rest, and prepares an outlet for the honey on each side. The antheræ reckoned all together are ten, one on the upper filament, and nine on the lower, each of the radii being furnished with a single one; they are small, all of one size, and terminate the radii.

PISTILLUM.—Single, growing out of the receptacle, within the calyx. The germen oblong, roundish, lightly compressed, straight, of the length of the cylinder of the lower filament which involves it. The style subulate, filiform, ascending, having the same length and position as the radii of the filament among which it is placed, and withering. The stigma downy, of the length of the style from the part turned upwards, and placed immediately under the antheræ.

PERICARPIUM.—A legumen, oblong, compressed, obtuse, bivalved, with a longitudinal suture both above and below; each suture straight, though the upper one falls near the base, and the lower one rises near the top. The legumen opens at the upper suture.

SEEDS.—A few, roundish, smooth, fleshy, pendulous, marked with an embryo that is a little prominent towards the point of insertion. When the ova are hatched, the cotyledons preserve the form of the halved seed.

RECEPTACLE.—The proper receptacles of the seeds are very small, very short, thinner towards the base, obtuse at the disk that fastens them, oblong, inserted longitudinally in the upper suture of the legumen only, but placed alternate: so that when the valvulæ have been parted, the seeds adhere alternately to each of the valves.

The ordinary situation of the flowers is obliquely pendulous; that is, at an acute angle from the perpendicular. The orders are four, viz.

Order I. PENTANDRIA, comprehending such plants as have five stamina. Of this order there is only one genus, viz. Monnieria.

Order II. HEXANDRIA, comprehending such plants as have six stamina. This order contains two genera, viz. Fumaria, Fumitory, and Saraca.

Order III. OCTANDRIA, comprehending such plants as have eight stamina. This order contains three genera, viz. Polygala, Milkwort, Securidaca, and Dalbergia.

Order IV. DECANDRIA, comprehending such plants as have ten stamina. This order contains fifty genera, distinguished into, 1. Such as have monodelphious* filaments; of which there are seventeen, viz. Nissolia, Erythrina, Coral Tree, Piscidia, Borbonia, Spartium, Broom, Genista, Single-seeded Broom, Aspalathus, African Broom, Amorpha, Bastard Indigo, Crotolaria, Ononis, Root Harrow, Anthyllis, Kidney Vetch, or Lady's Finger, Ebenus, Ebony of Crete, Abrus, Pterocarpus, Ulex, Furze, Whins, or Gorse Arachis, Ground Nut, and Lupinus, Lupine. 2. Such as have diadelphious† filaments and downy stigma; of which there are ten, viz. Phaseolus, Kidney Bean,

* One set, or brotherhood. † Two sets, or brotherhoods.

Dolichus, Glycine, Carolina Kidney Bean Tree, Clitoria, Pisum, Pea, Orobus, Bitter Vetch, Lathyrus, Chichling Vetch, Vicia, Vetch, Cicer, Chich Peas, and Ervum, Bitter Vetch. 3. Such as have diadelphious filaments, bilabiate calyces, and the stigma not downy, of which there are six, viz. Cytisus, Base Tree, Trefoil, Geoffroya, Robinia, False Acacia, Colutea, Bladder Senna, Glycirrhiza, Liquorice, and Coronilla, Jointed-podded Colutea. 4. Such as have diadelphious filaments, stigma that are not downy, and calyces not bilabiate; of which there are seventeen, viz. Ornithopus, Bird's Foot, Hippocrepis, Horse-shoe Vetch, Scorpiurus, Caterpillars, Hedysarum, French Honey-suckle, Æschynomene, Bastard Sensitive Plant, Indegofera, Indigo, Galega, Goat's Rue, Phaca, Bastard Milk Vetch, Astragalus, Liquorice Vetch, or Milk Vetch, Biserrula, Psoralea, Trifolium, Trefoil, Lotus, Bird's Foot Trefoil, Liparia, Trigonella, Fenugreek, Medicago, Sail and Moon Trefoil, and Mullera.

Of the eighteenth Class, POLYADELPHIA.

This class consists of such plants as bear hermaphrodite flowers, furnished with many sets of united stamina: the flowers have no particular character farther than is expressed in the title. The orders are four, viz.

ORDER I. PENTANDRIA, comprehending such plants as have five stamina in each set. Of this order there are two genera, viz. Theobroma, Chocolate Nut, and Abroma.

ORDER II. DODECANDRIA, comprehending such plants as have twelve stamina in each set. Of this order there is but one genus, viz. Monsonia.

ORDER III. ICOSANDRIA, comprehending such plants as have twenty stamina in each set. Of this order there is but one genus, viz. Citus, Citron.

ORDER IV. POLYANDRIA, comprehending such plants as have many stamina in each set. This order contains eight genera, viz. Hypericum, St. John's Wort, Ascyrum, St. Peter's Wort, Hopea, Symplocos, Melaleuca, Durio, Munchhausia, and Glabraria.

Of the nineteenth Class, SYNGENESIA.

This class consists of such plants as bear compound flowers. We have already paved the way for understanding this class, by the explanation of the titles of the class and its orders. What is farther necessary here, is to give the characters of the flowers. Compound flowers admit of a double description, viz. of the whole flower in its aggregate state, which is termed the Flosculose and Flower: 2. of the Flosculi florets, of which it is composed. We shall begin with the first, which concerns only the calyx and receptacle, those being the only parts that are in common.

Characters of the Flosculose Flower.

CALYX.—This common calyx is a perianthium, which contains the florets and the receptacle. It is either simple, augmented, or imbricated. It contracts when the flowers are fallen, but expands and turns back when the seeds are ripe.

RECEPTACLE. The common receptacle of the fructification receives many sessile florets on its disk, which is either concave, plain, convex, pyramidal, or globose. The surface of the disk is either naked, without any other inequality than that of being lightly dotted: villose, covered with upright hairs; or paleaceous, covered with paleæ, chaffs, or straws, that are linear, subulate, compressed, and erect, and serve to part the florets.

Characters of the Florets.

CALYX.—A small perianthium, often quinquepartite, seated on the germen, persisting, and becoming the crown of the seed.

COROLLA.—Monopetalous with a long and very narrow tube. It is seated on the germen, and is either tubulate, with the limb campanulate and quinquefid, and the laciniæ spreading and turning back; ligulate, with the limb linear, plane, turned outwards, and the top whole; tridentate, or quinquedentate; or wanting, having no limb, and often no tube.

STAMINA.—The filaments five, capillary, very short, inserted in the neck of the corollulæ. The antheræ five, linear erect; and by the union of their sides forming a cylinder, that is tubulate, quinquedentate, and of the length of the limb.

PISTILLUM.—The germen oblong under the receptacle of the flower; the style filiform, erect, of the length of the stamina, and perforating the cylinder of the antheræ; the stigma bipartite, the laciniæ revolute and spreading asunder.

PERICARPIUM.—No true one, though in some there is a coriaceous crust.

SEED.—A single one, oblong, often tetragonous, but commonly narrower at the base. It is either crowned, or with the crown wanting. The crown is of two kinds, either a pappius, or perianthium; if a pappus, it is either sessile, or placed on a stipes; and consists of many radii, that are placed in a round, and are either simple, radiate, or ramose; when the crown is a perianthium, it is such as is described above under that head.

ORDER I. POLYGAMIA ÆQUALIS, comprehending such plants as have compound flowers, of which the florets are all hermaphrodite. This order contains forty-two genera, distinguished into, 1. Such as have ligulate compound flowers, of which there are nineteen, viz. Goat's Beard, Viper Grass, Sowthistle, Lettuce, Gum Succory, Wild Lettuce, Dandelion, Hawkweed, Bastard Hawkweed, Downy Sowthistle, Nipple-wort, Candy Lion's Foot, Succory, or

Endive, and Golden Thistle. 2. Such as have tubulose compound flowers; of which there are twenty-tree, viz. Arctium, Burdock, Saw-wort, Thistle, Blessed Thistle, Woolly Thistle, Artichoke, Carline Thistle, Bastard Saffron, Water Hemp Agrimony, Alpine Colt's Foot, Distaff Thistle, Hemp Agrimony, Bastard Hemp Agrimony, Goldy Locks, African Fleabane, Lavender Cotton, and Barnadesia.

Order II. POLYGAMIA SUPERFLUA, comprehending such plants as have the florets of the disk hermaprodite, and those of the radius female. This order contains thirty-eight genera, distinguished into, 1. Tubulose; of which there are eight, viz. Tanacetum, Tansey, Artemesia, Mugwort, Gnaphalian, Cudweed. Xeranthemum, Austrian Sneezewort, or Eternal Flower, Carpesium, Baccharis, Plowman's Spikenard, Cotula, and Conyza, Fleabane. 2. Radiate; of which there are thirty, viz. Erigeron, Tussilago, Colt'sfoot, Senecio, Groundsel, Aster, Star-wort, Solidaga, Golden Rod, Inula, Elacampane, Cineraria, Sky Flower, Arnira, Doronioum, Leopard's Bane, Perdicium, Holenium, Bastard Sun Flower, Bellis, Leysera, Tagatos, African Marygold, Pectis, Chrysanthemum, Corn Marygold, Matricaria, Feverfew, Anacyclus, Anthemis, Chamomile, Achillea, Millfoil, Tridax, Trailing Starwort of Vera Cruz Zinnia, Verbesina, Sigesbeckia, Bupthalmum, Ox Eye, Eclipta, Bellium, Amellus, Unxia, and Mutisia.

Order III. POLYGAMIA FRUSTRANEA, comprehending such plants as have the florets of the disk hermaphrodite, and those of the radius neuter. This order contains nine genera, all radiate, viz. Helianthus, Sun Flower, Rudbeckia, Dwarf Sun Flower, Coreopsis, Tick-seeded Sun Flower, Gorteria, Osmites, Zoegea, Centaurea, Centaury, Sclerocarpus, and Didelta.

Order IV. POLYGAMIA NECESSARIA, comprehending such plants as have flowers of the disk male, and those of the radius female. This order contains fourteen genera, most of which are radiate, viz. Milleria, Silphium, Bastard Chrysanthemum, Chrysogonum, Melampodium, Calendula, Marygold, Arctotis, Osteospermum, Hardseeded Chrysanthemum, Othonna, African Ragwort, Polymnia, Eriocephalus, Filago, Cottonweed, Micropus, Bastard Cudweed, Baltimora, and Hippia.

Order V. POLYGAMIA SEGREGATA. This order comprehends such plants as have many partial cups contained in the common calyx, which separate and surround the floscula. This order contains seven genera, distinguished into, 1. Such as have four flosculi in each partial calyx; of which there are two genera, viz. Elephantopus, and Oedera. 2. Such as have many flosculi in each partial calyx; of which there is only one genus, viz. Sphæranthus. 3. Such as have one flosculus in each partial calyx; of which there are three genera, viz. Echinops, Gundelia, and Stoebe. 4. Such as have three flosculi in each partial cup, of which there is only one genus, viz. Jungia.

Order VI. MONOGAMIA, comprehending such plants as have simple flowers. This order contains seven genera, viz. Strumfia,

Seriphium, Corymbium, Jasione, Sheep Scalions, Lobelia, Cardinal Flower, Viola, Violet, and Impatiens, Balsam, or Female Balsamine.

Of the twentieth Class, GYNANDRIA.

This class consists of such plants as have the stamina growing either upon the style itself, or upon a receptable that stretches out into the form of a style, and supports both the stamina and the pistillum. The orders are nine, viz.

ORDER I. DIANDRIA, comprehending such plants as have two stamina. The flowers of this order have a most singular structure, answering to the following description.

Characters of the Order DIANDRIA, *of the Class* GYNANDRIA.

The germen is always contort; the petals are five; the style grows to the inner margin of the nectarium. The filaments are always two, supporting as many antheræ. The fruit is a capsule.

ORDER I. DIANDRIA, comprehending such plants as have two stamina, this order contains eleven genera, viz. Orchis, Satyrium, Lizard Flower, Ophrys, Twyblade, Serapias, Helleborine, Limodorum, Arethusa, Cypripedium, Ladies Slipper, Epidendrum, Vanilla or Vanelloe, Gunnera, Forstera, and Disa.

ORDER II. TRIANDRIA, comprehending such plants as have three stamina. This order contains four genera, viz. Sisyrinchium, Bermudiana, Ferraria, Stilago, and Salacia.

ORDER III. TETRANDRIA, comprehending such plants as have four stamina. Of this order there is but one genus, viz. Nepenthes.

ORDER IV. PENTANDRIA, comprehending such plants as have five stamina. This order contains three genera, viz. Passiflora, Passion Flower, Gluta, and Ayenia.

ORDER V. HEXANDRIA, comprehending such plants as have six stamina. This order contains two genera, viz. Aristolochia, Birthwort, and Pistia.

ORDER VI. OCTANDRIA, comprehending such plants as have eight stamina. Of this order there is only one genus, viz. Scopolia.

ORDER VII. DECANDRIA, comprehending such plants as have ten stamina. Of this order there are but two genera, viz. Helicteres, Skrew tree, and Kleinhovia.

ORDER VIII. DODECANDRIA, comprehending such plants as have twelve stamina. This order contains but one genus, viz. Cytinus.

ORDER IX. POLYANDRIA, comprehending such plants as have many stamina. This order contains eight genera, viz. Grewia, Xylopia, Arum, Wake Robin, or Cuckoo Pint, Dracontium, Dragons, Colla, African Arum, Pothos, Ambrosinia, and Zostera, Grass Wrack.

Of the twenty-first Class, MONOECIA

This class consists of such plants as have hermaphrodite flowers, but bear both male and female flowers on the same plant. The orders of this class are eleven, viz.

ORDER I. MONANDRIA, comprehending such plants as have their male flowers furnished with one stamen. This order contains ten genera, viz. Zanichellia, Triple-headed Pond Weed, Ceratocarpus Cynomorium, Elaterium, Chara, Ægopricon, Artocarpus, Nipa, Casuarina, and Phyllachne.

ORDER II. DIANDRIA, comprehending such plants as have their male flowers furnished with two stamina. This order contains two genera, viz. Lemna, Duck Meat, and Anguria.

ORDER III. TRIANDRIA, comprehending such plants as have their male flowers furnished with three stamina. This order contains twelve genera, viz. Omphalea, Typha, Cat's Tail, or Reed Mace, Sparganium, Burr Reed, Zea, Indian, or Turkey Wheat, Coix, Job's Tears, Tripsacum, Olyra, Carex, Axyris, Tragia, Hernandia, Jack in a Box, and Phyllanthus, Sea-side Laurel.

ORDER IV. TETRANDRIA, comprehending such plants as have their male flowers furnished with four stamina. This order contains nine genera, viz. Centella, Betuda, Birch, Buxus, Box Tree, Urtica, Nettle, Morus, Mulberry Tree, Cicca, Serpicula, Littorella, and Aucuba.

ORDER V. PENTANDRIA, comprehending such plants as have the male flowers furnished with five stamina. This order contains eight genera, viz. Xanthium, Lesser Burdock, Ambrosia, Parthenium, Bastard Feverfew, Iva, Jesuits Bark Tree, Leea, Amaranthus, Amaranth or Flower Gentle, Nephelium, and Clibadium.

ORDER VI. HEXANDRIA, comprehending such plants as have their male flowers furnished with six stamina. Of this order there are two genera, viz. Zizania, and Pharus.

ORDER VII. HEPTANDRIA, comprehending such plants as have their male flowers furnished with seven stamina. Of this order there is but one genus, viz. Guettarda.

ORDER VIII. POLYANDRIA, comprehending such plants as have their male flowers furnished with many stamina. This order contains thirteen genera, viz. Ceratophillum, Myriophillum, Water Millfoil, Sagittaria; Arrowhead, Begonia, Theligonum, Dogs Cabbage, Poterium, Burnet, Quercus, Oak, Juglans, Walnut, Fagus, Beech, Carpinus, Hornbeam, Corylus Hazel, or Nut-tree, Platanus, Planetree, and Liquidambar, Sweet Gum.

ORDER IX. MONADELPHIA, comprehending such plants as have their male flowers furnished with one set of united stamina. This order contains fifteen genera, viz. Hura, Sand Box-tree, Pinus, Pine-tree. Cupressus, Cyprus, Thuja, Arbor Vitæ, Acalypha, Delechampia, Plukenetia, Cupania, Croton, Tallow tree, or Bastard Licinus, Ricinus, Palma Christi, Jatropha, Cassava, Sterculia, Hippomane, Manchineal, Stillingia, and Gnetum.

Order X. SYNGENESIA, comprehending such plants as have their male flowers furnished with stamina, of which the antheræ are united. This order contains six genera, viz. Tricosanthes, Serpent Cucumber, Momordica, Male Balsam Apple, Cucumis, Cucurbita, Gourd, Sicyos, Single-seeded Cucumber, and Bryonia, Bryony.

Order XI. GYNANDRIA, comprehending such plants as have their male flowers furnished with stamina that grow out of a kind of style, or imperfect pistillum, the perfect one being in the female flower. This order contains two genera, viz. Andrachne, Bastard Orpine, and Agyneia.

Of the twenty-second Class, Dioecia.

This class consists of such plants as have no hermaphrodite flowers, but bear male and female flowers on distinct plants. The orders of this class are fourteen, viz.

Order I. MONANDRIA, comprehending such plants as have their male flowers furnished with one stamen. This order contains only two genera, viz. Najas, and Pandanus.

Order II. DIANDRIA, comprehending such plants as have their male flowers furnished with two stamina. This order contains three genera, viz. Vallisneria, Salix, Willow, and Cecropia.

Order III. TRIANDRIA, comprehending such plants as hav their male flowers furnished with three stamina. This order contain six genera, viz. Empetrum, Black-berried Heath, or Crow-berries Osyris, Poet's Cassia, Caturus, Excoecaria, Restio, and Maba.

Order IV. TETRANDRIA, comprehending such plants as have their male flowers furnished with four stamina. This order contains seven genera, viz. Viscum, Misletoe, Hippophæ, Sea Buckthorn, Myrica, Candleberry Myrtlegale, or Sweet Willow, Trophis, Batis, Montinia, and Brucea.

Order V. PENTANDRIA, comprehending such plants as have their male flowers furnished with five stamina. This order contains twelve genera, viz. Pistacia, Pistacia Nut, Zanthoxylum, Tooth-ach Tree, Astronium, Irisine, Ancidesma, Spinacia, Spinage, Acnida, Cannabis, Hemp, Humulus, Hop, Zanonia, Fewillea, and Canarium.

Order VI. HEXANDRIA, comprehending such plants as have their male flowers furnished with six stamina. This order contains four genera, viz. Tamus, Black Byrony, Smilax, Rough Bindweed, Rajania, and Dioscorea.

Order VII. OCTANDRIA, comprehending such plants as have their male flowers furnished with eight stamina. This order contains three genera, viz. Populus, Poplar, Rhodiola, Rose Root, and Magaritaria.

Order VIII. ENNEANDRIA, comprehending such plants as have their male flowers furnished with nine stamina. This order contains two genera, viz. Mercurialis, Mercury, and Hydrocharis, Frog's Bit.

ORDER IX. DECANDRIA, comprehending such plants as have their male flowers furnished with ten stamina. This order contains four genera, viz. Carica, Papaw, Kiggelaria, Coriaria, Myrtle-leaved Sumach, and Schinus, Indian Mastic.

ORDER X. DODECANDRIA, comprehending such plants as have their male flowers furnished with twelve stamina. This order contains three genera, viz. Menispermum, Moon Seed, Datisca, Bastard Hemp, and Euclea.

ORDER XI. ICOSANDRIA, comprehending such plants as have their male flowers furnished with many stamina inserted into the calyx. Of this order there is but one genus, viz. Flacourtia.

ORDER XII. POLYANDRIA, comprehending such plants as have their male flowers furnished with many stamina. Of this order there are two genera, viz. Cliffortia, and Hedycaria.

ORDER XIII. MONODELPHIA, comprehending such plants as have their male flowers furnished with one set of united stamina. This order contains six genera, viz. Taxus, Yew Tree, Juniperus, Juniper, Ephedra, Shrubby Horse-tail, Cissampelos, Napæa, and Adelia.

ORDER XIV. SYNGENESIA, comprehending such plants as have male flowers furnished with stamina of which the antheræ are united. Of this order there is but one genus, viz. Ruscus, Knee Holly, or Butcher's Broom.

ORDER XV. GYNANDRIA, comprehending such plants as have their male flowers furnished with stamina that grow out of a kind of style, or imperfect pistillum, the perfect one being in the female flower. Of this order there is but one genus, viz. Clutia.

Of the twenty-third Class, POLYGAMIA.

This class consists of such plants as bear hermaphrodite flowers, and also either male or female flowers, or both. The orders of this class are three, viz.

ORDER I. MONOECIA, comprehending such plants as have the polygamy on the same plant. This order contains twenty-four genera, distinguished into, 1. Such as are polygamous by male hermaphrodites, and female hermaphrodites, of which there is but one genus, viz. Musa, Plaintain Tree. 2. By hermaphrodites and males; of which there are twenty-two, viz. Ophioxylon, Celtis, Nettle Tree, Veratrum, White Hellebore, Fusanus, Andropogon, Holcus, Indian Millet, Apluda, Ischæmum, Cenchras, Ægilops, Valentia, Cross-wort, Parietaria Pellitory, Atriplex, Orach, Babeium, African Almond, Acer, Maple, Gouania, Solandra, Terminalia, Clusia, Balsam Tree, Hermas, Spinifex, and Manisurus. 3. By hermaphrodites, and females; of which there is but one genus, viz. Minosa, Sensitive Plant.

ORDER II. DIOECIA, comprehending such plants as have the polygamy on two distinct plants. This order contains ten genera, distinguished into, 1. Such as are polygamous by hermaphrodites and

females; of which there are two, viz. Fraxinus, Ash, and Gleditsia,* Three-thorned Acachia. 2. By hermaphrodites and males; of which there are, viz. Diospyrus, Indian Date Plum, Nyssa, Dupelo Tree, and Pisonia, Fringrigo. 3. By androgynous and males; of which there are five, viz. Anthospermum. Amber Tree, Arctopus, Panax, Ginseng, Chrysitrix, and Stilbe.

ORDER III. TRIOECIA, comprehending such plants as have the polygamy on three distinct plants. This order contains two genera, viz. Ficus, Fig, and Ceratonia, Carob Tree, or St. John's Bread.

Of the twenty-fourth Class, CRYPTOGAMIA. †

This class consists of such plants as conceal their fructification, having their flowers either within the fruit, or so small, as not to be perceptible to the naked eye. The fructification of these is also of an uncommon structure. The orders are four, viz.

ORDER I. FILICES, Ferns, comprehending such plants as are odorisiferous.‡ What is known of the fructification of these plants, amounts only to the few characters following.

Character of the FILICES.

CALYX.—A squama growing out of the leaf, opening on one of its sides; and under which there are pedunculate globules; each globule is girt with an elastic ring, which breaks elastically, and sheds a dust, which are the seeds.

This order contains eighteen genera; which, not admitting of any certain distinction from their fructification, have been ranged by Linnæus according to their situation under their covers, and are as follows, viz. Cycas, Sego Palm, Zamia, Quistetum, Horse Tail, Onoclea, Sensible Polypody, Ophioglossum, Adder's Tongue, Osmund, Royal, or Flowering Fern, Acrosticum, Forked Fern, Pteris, Braks, or Female Fern, Blechnum, Hemionitis, Mule's Fern, Lonchitis, Rough Spleenwort, Asplenium, Spleenwort, or Miltwaste, Polypodium, Polypody, Adianthum, Maiden Hair, Trichomanes, Marsilea, Pilularia, Pepper Grass, and Isoetes.

ORDER II. MUSCI, Mosses. The character of the plants comprehended under this title are, antheræ without filaments; the

* In gleditia the hermaphrodites and males are on the same plant, and the females on a distinct one.

† The plants of this class are often of a dangerous quality.

‡ Bearing the fruit on the back of the leaf. These have been called also epi-phyllospermous, a Greek compound, expressive of the same circumstance; capillary, as being esteemed good for the hair; and caules, without stems; for in these plants, what rises out of the ground is plainly a leaf only; one of the characters of a stem or trunk is to be alike on every side; but in the stalks of ferns, there is manifestly a front and back, the former being flat and channelled, and the latter convex; which shews them to be leaves.

female flowers distinct and without any pistillum; and the seeds, consisting only of a naked corculum, without cotyledon or tunic. The genera of this order have been distinguished by Linnæus, according to the following circumstance, viz. the antheræ, with or without a calyptra,* placed on the same plant as the female floret, or on a distinct one; and the female aggregate, or single. The order contains eleven genera, viz. Lycopodium. Wolf's Claw Moss, Perolla, Sphagnum, Bog Moss, Phascum, Splachnum, Polytrichum, Golden Maiden Hair, Mnium, Bryum, Hypnum, Fontinalis, Water Moss, and Buxbaumia.

Order III. ALGÆ, Flags. The plants comprehended under this order have their root, stem, and leaf all in one. The characters of the fructification of this order are not yet known, excepting the few descriptions given by Michelius. The genera are twelve, viz. Jungermania, Targionia, Marchantia, Blasia, Riccia, March Liverwort, Anthoceros, Lichen, Liverwort, Tremella, Fucus Wrack, or Sea Weed, Ulva, Laver, Conferva, and Byssus.

Order IV. FUNGI, Mushrooms. The genera of this order are given by Linnæus after the method of Dillenius. The fructification being imperfectly known, no character can be assigned for this order, farther than the title, which is familiar to every one. The genera are ten, viz. Agaricus, Agaric, Boletus, Hydnum, Phallus, Stink-horns, Clathrus, Helvella, Peziza, Cup Mushroom, Clavaria, Lycoperdon, and Mucor.

Of the twenty-fifth Class, Palmæ.

Comprehending such plants as have a spadax and spatha. This order contains nine genera, viz. Chamærops, Dwarf Palm, or Palmetto, Borassus, Corypha, Cocos, Cocoa Nut, Phœnix, Common Palm, or Date Palm Tree, Elais, Areca, Arica Nut, Elate, and Caryota.

From this short sketch of the science of botany, it will be easily seen in what manner it is applied, in order to discover the genus and species of any unknown plant. When a plant is gathered in flower, the number of the stamina will refer to the class, and the pistils to the order, except in the twelve last classes, which are distinguished by other marks. When the order is found, the genus is next to be discovered, which is done by observing the calyx, the corolla, the pericarpium, and the seeds, as well as the form and situation of the stamina and pistils. The species are distinguished by some specific difference of the root, the trunk, the branches, or the leaves, and they are called by some trivial name, expressive of the specific difference, or some other circumstance; thus we find the yellow gentian, the lesser centuary, the rough-leaved, and the smooth-leaved witch elms, &c. It is evident, that in such a work

* A Veil.

as this, it is barely possible to preserve the names of the different genera; for those who wish to proceed in the science, and to know their description, as well as specific differences, we must be content with recommending the Systema, Genera, and Species Plantarum of Linnæus, or the Families of the Plants, published by the Lichfield Society. Or, for a further introduction to the science (if that be necessary) there cannot be a more elegant elementary book, than Professor Martyn's Letters on Botany.

Vegetables, according to their natural order, are divisible into the seven families or tribes following, viz.

1. FUNGI, Mushrooms

2. ALGÆ, Flags; whose root, leaf, and stem are all one.

3. MUSCI, Mosses; whose antheræ have no filaments, and are placed at a distance from the female flower, and whose seeds also want their proper tunic and cotyledons.

4. FILICES, Ferns; whose fructification is on the back of the frondes.

5. GRAMINA, Grasses; which have simple leaves, a jointed culm or stem, a glumose calyx, and a single seed.

6. PALMÆ, Palms; which have simple stems that are frondose at the summit, and have their fructification on a spadix issuing from a spatha.

7. PLANTS, which include all that do not enter into any of the other divisions. These are,

Herbaceous, when they die down to the root every year; for in the perennial kinds, the buds are all produced on the root below the surface of the ground.

Shrubs, when their stems come up without buds.

And Trees, when their stems come up with buds.

It is impossible to finish our short review of nature, without observing the wonderful harmony and connection that subsists between all the different branches; without observing how happily one part supports another, and how every thing contributes to the general good. How infinitely great must be that Eternal Mind who framed all with such amazing skill! Who sees, with a single glance, the operation and mechanism of the whole, from the minute anatomy of the ant, from the almost inconspicuous vegetation of the various tribe of mosses, to those innumerable worlds, those vast and splendid orbs, that gild the unbounded expanse of the universe.

A GLOSSARY;

EXPLAINING

THE TECHNICAL TERMS

IN

BOTANY,

IN ALPHABETICAL ORDER;

By consulting which, any Book of Botany may easily be understood.

ABBREVIATUM *perianthium*, shortened, when the cup is shorter than the tube of the flower.
Abortiens *flos*, barren flowers, such as produce no fruit.
Abruptum *folium pinnatum*, winged leaves, ending without either foliole or cirrhus.
Acaulis, without stalk or stem.
Accrosum *folium*, chaffy leaves, when they are linear and abiding, as in Pinus, Abies, and Juniperus.
Acicularis, needle-shaped, as in scirpus acicularis.
Acinacifo me, falchion or scimitar-shaped, as in mesembry-anthemum acinaciforme.
Acini, the small berries which compose the fruit of a mulberry or bramble.
Acotyledones, plants whose seeds have no cotyledons or seminal leaves.
Aculei, prickles fixed in the rind or surface of the bark.
Aculeatus *caulis*, a stalk or stem furnished with prickles.
Acuminatum *folium*, a leaf ending in a point.
Acutum *folium*, leaves terminating in an acute angle.
Adnatum *folium*, the disk of the leaf pressing close to the stem of the plant.
Adpressa *folia*, the disk of the leaf pressed towards the stem.
Adscendens *caulis*, a stalk or branch inclining upwards.
Adversum *folium*, when the sides of the leaf are turned towards the south.
Aggregatus *flos*, an assemblage of flowers coming in clusters.
Aggregate, an order of plants in the fragmenta methodi naturalis of Linnæus.
Ala, a wing, the side petals of papilionaceous blossom, or a membrane added to a seed, stalk, &c.
Alatus *petiolus*, when the foot-stalk of a leaf is winged with membranes.
Alburnum, the white substance that lies between the inner bark and the wood of trees.
Algæ, flags, one of the seven families of plants.
Alterni rami *folia*, when they come out singly, and follow in gradual order.
Amentaceæ, an order of plants in the fragmenta methodi naturalis of Linnæus, bearing catkins.
Amentum, a catkin.
Amplexicaule *folium*, embracing the stalk when the base of the leaf embraces the stem sideways.
Anceps *caulis*, double-edged, when a stalk is compressed, and forms two opposite acute angles.
Androgynà, plants bearing male and female flowers on the same root.

, Angulatus *caulis*, angulated stalks.
Angustifosia, narrow leaved.
Angiospermia, the second order in the class didynamia of Linnæus; containing plants whose seeds are covered with a capsule.
Annua *radix*, an annual root; that which lives but one year.
Anthera, the summit of the stamina bearing the pollen, and is a part of the principal male organ of generation.
Apertura, an aperture, opening in some species of anthera.
Apetalus *flos*, having no petals or corolla.
Apex, the top or summit.
Aphyllus *caulis*, destitute of leaves.
Apophysis, an excrescence from the receptacle of the musci.
Appendiculatus *petiolus*, a little appendage hanging from the extremity of the foot-stalk.
Approximata *folia*, leaves growing near each other.
Arbor, a tree.
Arbustiva, a copse of shrubs or trees, an order of plants in the fragmenta methodi naturalis of Linnæus.
Arcuatum *legumen*, arched, a pod that is curved or bent.
Arillus, the proper exterior coat of a seed that falls off spontaneously.
Arista, the beard of corn or grasses.
Arma, arms, weapons, one of the seven kinds of fulcra of plants.
Articulatus *caulis*, culmus, having knots of joints.
Articulatus *culmi*, the straight part of the stalk between the two joints.
Asperifolia, rough-leaved plants, an order of plants in the fragmenta methodi naturalis of Linnæus.
Assurgentia *folia*, first bent down, but rising erect towards the apex.
Attenuatus *pedunculus*, when the foot-stalk grows smaller towards the flower.
Auctus *calyx*, augmented, having a series of distinct leaves, shorter than its own, that surround its base.
Avenia *folia*, leaves which have no visible veins.
Auriculatum *folium*, an ear-shaped leaf, when the leaf towards the base has a lobe on each side.
Axillaria *folia*, growing out of the angles formed by the branches and the stem.

Bacca, a berry; or a pulpy pericarpium without valves, in which the seeds are naked.
Barba, a beard, a species of pubescence, sometimes on the leaves of plants, as on the mesembryanthemum barbatum.
Barbatum *folium*, when a bunch of strong hairs terminate the leaves.
Bicornes, plants, whose antheræ have the appearance of two horns. Likewise an order of plants in the fragmenta methodi naturalis of Linnæus.
Biennis *radix*, a root which continues to vegetate two years.
Bifaria *folia*, a leaf pointing two ways.
Biferæ *plantæ*, flowering twice a year.
Bisidum *folium*, divided or cloven into two parts.
Bilorus *pedunculus*, bearing two flowers on a foot-stalk.
Bilgeminum *folium*, a forked foot-stalk with two little leaves on the apex of each division.
Bijugum *folium*, a winged leaf, bearing two pair of foliola.
Bilabiata *corolla*, a corolla with two lips.
Bilobum *folium*, a leaf consisting of two lobes.
Binata *folia*, a digitate leaf consisting of two foliola.
Bipartitum, *folium*, a leaf divided into two segments.
Bipinnatum *folium*, doubly winged, when the folioles of a pinnate leaf are pinnate.
Biternatum *folium*, where there are three folioles on a petiole, and each foliole is ternate; as in epimedium.
Bivalve *pericarpium*, consisting of two valves, as in the siliqua and legumen.
Brachiatus *caulis*, branching in pairs; each pair standing at right angles with those above and below.

Brachium, the arm, tenth degree in the Linnæus scale for measuring plants, being twenty-four Parisian inches.
Bractæa, a floral leaf, these are generally of a different shape and colour from the other leaves of the plant, and are always seated near the fructification.
Bracteatus, having a bractæa growing out of it.
Bulbiferus *caulis*, a stalk bearing bulbs, as in a species called lilium bulbiferum.
Bulbosa *radix*, a bulbous root, and is either squmosa, scaly, as in lilium; tunicata, coated, as in cepæ; duplicate, double, as in fritiliaria; or solida, as in tulipa.
Bullatum *folium*, when the surface of the leaf rises above veins, so as to appear like blisters.

Caducus *calyx*, to fall off; a term signifying the shortest time of duration, falling off at the first opening of the flower.
Calamariæ, a reed, an order of plants in the fragmenta methodi naturalis of Linnæus.
Calcariatum *nectarium*, a kind of nectarium resembling a spur as in the delphinium.
Caliculatus *calyx*, a little calyx added to a larger one, as in the coreopsis, leontice, &c.
Calycanthemi, a calyx, order of plants in the fragmenta methodi naturalis of Linnæus.
Calyptra, a veil, in mosses, where it is placed over tne antheræ.
Calyx, a flower cup, of which there are the following kinds, viz. perianthium, involucrum, amentum, spatha gluma, calyptra, and volva.
Campanacei, an order of plants in the fragmenta methodi naturalis of Linnæus.
Campanulata *corolla*, bell-shaped flowers.
Canaliculatum *folium*, leaves having a deep channel running from the base to the apex.
Candelares, an order of plants in the fragmenta methodi naturalis of Linnæus.
Capillaceum *folium*, capillary, exemplified in the ranunculus aquatilis.
Capillaris *pappas*, hairy down, as in heiracium, and sonchus.
Capillus, hair, the first degree of the Linnæan scale for measuring plants, the diameter of a hair, and the twelfth part of a line.
Capitati *flores*, flowers collected into heads, as in the mentha aquatica, and thymus serpyllum.
Capitulum, a little head, a species of inflorescentia, in which the flowers are connected into close heads on the tops of the peduncles as in gomphrena.
Capreolus, a tendril, see *Cirrhus.*
Capsula, a capsule, a hollow pericarpium, which cleaves or parts in some determinate manner, and consists of valvula dissepimentum, columella, and loculamentum.
Carina, the keel of a boat or ship, the lower petal of the papilionaceous corolla.
Carmatum *folium*, when the back of a leaf resembles the keel of a ship.
Cariophyllæus *flos*, clove-tree, or flowers growing in the manner of carnations.
Carnosum *folium*, a fleshy leaf, as in sedum dasyphillum.
Cartilagineum *folium*, a leaf whose brim is furnished with a margin of different substance from the disk.
Caryophylli, carnations or pinks, an order of plants in the fragmenta methodi naturalis of Linnæus.
Catenulata *scabrities*, species of glandular roughness, hardly visible to the naked eye, resembling little chains on the surface of some plants.
Caudex, the stem of a tree.
Caulescens, having a stalk, or stem.
Caulina *folia*, leaves growing immediately on the stem.

Caulis, a stem, a species of truncus.
Cernuus, nodding or hanging down its head.
Cespitosa, plants which produce many stems from one root, and form a surface of turf or sod.
Ciliatum, whose margin is guarded by parallel bristles, formed like the eye-lash.
Circinalea, *folia*, a hoop or ring, a term of foliation, expressive of the leaves within the gemma, being rolled spirally downward.
Circumscissa *capsula*, cut transversely, as in anagallis.
Cirrhiferus *pedunculis*, a peduncle bearing a tendril, as in vitis.
Cirrhosum *folium*, a leaf that terminates in a tendril, as in gloriosa.
Cirrhus, a clasper, or tendril, one of the fulcra of plants.
Classes, a class defined by Linnæus to be an agreement of several genera in the parts of fructification, according to the principles of nature distinguished by art.
Clavatus *petiolus*, *pedunculus*, when the foot-stalk of the leaf or flower is club-shaped, tapering from the base to its apex.
Clavicula, a little key, a tendril.
Clausa *corolla*, when the neck of the corolla is close shut in with valves.
Coadunatæ, to gather together, an order of plants in the fragmenta methodi naturalis of Linnæus.
Coarctati *rami*, close together, opposed to Divericatus.
Cochleatum *legumen*, a pod like the shell of a snail, as in medicago.
Coloratum *folium*, coloured, when leaves which are generally green, are of a different colour.
Columnelia, a little column, the substance that passes through the capsule, and connects the several partitions and seeds.
Columniferi, pillar-shaped, an order of plants in the fragmenta methodi naturalis of Linnæus.
Coma, a bush, or head of hair, a species of fulcra, composed of large bractæa, which terminates the stalk, as in lavandula, salvia, &c.
Communis *gemma*, regards the contents, of the gemma, containing both flower and fruit.
Communis *calyx*, when a cup contains both receptacle and flower.
Comosæ, a head of hair, an order of plants in the fragmenta methodi naturalis of Linnæus.
Comosa *radix*, the fibres which put forth at the base of a bulbous root, resembling a head of hair.
Compactum *folium*, when the leaf is of a compact and solid substance.
Completus *flos*, having a perianthium and corolla.
Compositus *caulis*, a compound stem, diminishing as they ascend.
Compositum *folium*, when the petiole bears more than one leaf, of which are the following species, viz. articulatum, digitatum, conjugatum, pedatum, pinnatum decompositum, supra-decompositum.
Compositi, an order of plants in the fragmenta methodi naturalis of Linnæus.
Compressus, *caulis*, *folium*, a leaf resembling a cylinder compressed on the opposite sides.
Concavum *folium*, hollowed, the margin forms an arch with the disk.
Conceptaculum, conceptacle or receiver, a pericarpium of a single valve, which opens on the side lengthways, and has not the seeds fastened to it.
Conduplicatum *folium*, doubled together, when the sides of the leaf are parallel, and approach each other.
Conferti *rami*, branches crowded together.
Confertus *verticillus flos*, *et folia*, when flowers and leaves are formed into whorles round the stalk, and are crowded together.
Confluentia *folia*, to flow together, as in the pinnated leaf, when the pinnæ run into one another
Conglobatus *flos*, when flowers are collected into globular heads.
Conglomeratus *flos*, flowers irregularly crowded together.
Congesta *umbella*, flowers collected into a spherical shape, as in the allium.
Conica *scabrities*, a species of cetaceous scabrities, scarce visible to the naked eye, on the surface of plants, formed like cones.

Coniferæ, plants bearing cones, such as pinus, cupressus, &c. an order of plants in the fragmenta methodi naturalis of Linnæus.
Conjugatum, to join or couple together, a species of pinnate leaf, where the folioles come by pairs.
Connatum, to grow together, when two opposite leaves unite at their base, so as to have the appearance of one leaf.
Connivens *corolla*, when the apices of petals converge, so as to close the flower, as in Trollius Europæus.
Conniventes *antheræ*, approaching or inclining together.
Continuatum *folium*, continued, when the leaf appears to be a continuation of the substance of the stalk.
Contorti, to twist, an order of plants in the fragmenta methodi naturalis of Linnæus.
Contrariæ, valves are termed contraria, when the dissepimentum is placed transversely between them.
Convexum *folium*, a leaf rising from the margin to the centre of the leaf.
Convolutus *cirrhus*, a tendril twining in the same direction with the sun's motion.
Convolutum *folium*, a term in foliation, when the leaf is rolled up like a scroll of paper.
Conus, see *Strobilus*.
Corculum, the heart and essence of the seed.
Cordatum *folium*, the heart-shaped leaf.
Condiformus, shaped like a heart.
Corolla, a wreath or crown, one of the seven parts of fructification.
Corollula, a little corolla.
Corona *seminis*, a crown adhering to many kinds of seeds, serving them as wings, which enables them to disperse.
Coronariæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Coronula, a little crown.
Cortex, the outer rind or bark of vegetables.
Corydales, an order of plants in the fragmenta methodi naturalis of Linnæus.
Corymbus is a kind of spike, the flowers of which have each its proper pedicellus, or partial foot-stalk raised to a proportional height, as in spirea opulifolia.
Cotyledon, a side tube of the seed, of a porous substance; and perishable, or seminal leaves.
Crenatum *folium*, a notched leaf, when the margin is cut into angles that point towards neither of the extremities; obtusely crenate, when the angles are rounded, or acutely crenate, when the angles are pointed.
Crispum *folium*, a curled leaf, when the circumference becomes larger than the disk admits of.
Cristatus *flos*, when the flower has a tufted crest, as in polygala.
Cruciformes *flores*, cross-shaped flowers, consisting of four petals, disposed in the form of a cross, as in the class tetradynamia of Linnæus.
Cryptogamia, hidden marriages, the twenty-fourth class of the Linnæan system.
Cubitus, a cubit, the ninth degree of the Linnæan scale for measuring plants, from the elbow to the extremity of the middle finger, or seventeen Parisian inches.
Cucullatum *folium*, leaves rolled up lengthways, in form of a cone, as in geranium cucullatum, &c.
Cucurbitaceae, gourds, an order of plants in the fragmenta methodi naturalis of Linnæus.
Culminiæ, the top or crown of any thing, an order of plants in the fragmenta methodi naturalis of Linnæus.
Culmus, a reed or straw, the proper stem or trunk of a grass.
Cuspidatum *folium*, a leaf, whose apex resembles the point of a spear or lance.
Cuneiforme *folium*, a wedge-shaped leaf.
Cyathiformis *corolla*, flowers of the form of a cup.
Cindracea *spica*, a spike of flowers in form of a cylinder.

Cyma, that runs into long fastigiate peduncles, proceeding from the same universal centre, but with irregular partial ones.
Cymosus *flos*, see *Cyma*.
Cymosæ, an order of the plants in the fragmenta methodi naturalis of Linnæus.

Dæadaleum *folium*, a leaf whose texture is remarkably beautiful and exquisitely wrought
Debilis *caulis*, feeble stalk.
Decagynia, ten females, the fifth order in the tenth class; flowers that have ten styli.
Decandria, ten males, the tenth class of Linnæus.
Decaphyllus *calyx*, a calyx consisting of ten leaves.
Deciduum *folium*, leaves that fall off in winter.
Declinatus *caulis*, a stalk bending toward the earth.
Decomposita *folia*, when a petiole once divided connects many folioles.
Decumbens, to lie down.
Decurrens *folium*, running down, when the base of a sessile leaf extends itself downwards along the stem, beyond the proper base or termination of the leaf.
Decursive *folium penatum*, when the bases of the foliole are continued along the sides of the petiolus.
Decussata *folia*, to divide, when leaves grow in pairs, and opposite, each pair being opposite alternately.
Deflexus *ramus*, a branch bent a little downwards.
Defloreta *stamina*, having shed or discharged the farina fecundans.
Defoliatio, the time in autumn when the plants shed their leaves.
Deltoides *folium*, a leaf formed like the Greek delta, as in the mesembryanthemum.
Demersum *folium*, in aquatic plants, leaves sunk below the surface of the water.
Dendroides *surculus*, shrub-like, a subdivision of the surculous in the genus hypnum.
Dentatum *folium*, leaves having horizontal points of the same consistence of the leaf, and standing at a little distance from each other.
Denudatæ, to be stripped naked, an order of plants in the fragmenta methodi naturalis of Linnæus.
Dependens *folium*, to hang down, leaves pointing towards the ground.
Depressum *folium*, pressed down when the sides rise higher than the disk.
Diadelphia, two brotherhoods, the seventeenth class in the sexual system.
Diandria, two males, the second class in the sexual system.
Dichotomus *caulis*, forked stalks, when the divisions come by two and two.
Dicotyledones, when the seeds have two cotyledons that are the placenta of the embryo plant, and afterwards the seed leaves.
Didyma *anthera*, twins, when anthera come by twos on each filament.
Didynamia, the superiority of two, the fourteenth class in the sexual system.
Difformia *folia*, different forms, when leaves on the same plant come of different forms.
Diffusus *caulis*, when the branches of the stalk spread different ways.
Digitatum *folium*, fingered, when the apex of a petiole connects many folioles.
Digynia, two females, the second order in each of the first thirteen classes, except the ninth.
Dimidiatum, halved.
Dioecia, the twenty-second class in the sexual system.
Diepetala *corolla*, flowers consisting of two petals, as in circæa, and commelina.
Diphyllus *calyx*, a calyx consisting of two leaves, as in the papaver, and fumaria.
Discus, a disk, the middle part of a radiate compound flower.
Disperma, plants producing their seeds by twos, as in the umbellatæ.
Dissectum, *folium*, leaves cut into lacimia, or divisions.

Dissepimentum, partitions of the fruit, which divide the pericarpium into cells.
Dissiliens *siliqua*, pods that burst with elasticity.
Distant *vertillus*, when the whorles of flowers, in verticillate plan, stand at a great distance from one another.
Disticha *folia*, in two rows, when leaves all respect two sides of the branches only.
Divaricati *rami*, branches standing wide from each other in different directions.
Divergentes *rami*, widening gradually.
Decandria, twelve males, the eleventh class in the sexual system.
Dodrans, the seventh degree in the Linnæan scale for measuring the parts of plants, or nine Parisian inches.
Dolabriforme *folium*, a leaf resembling an ax, as in mesembryanthemum dolabriforme.
Dorsalis *arista*, an awne or beard, fixed to the back, or external part of the gluma.
Drupa, a pulpy pericarpium, without valves, containing a stone, as in the plum and peach.
Drupaceæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Dumosæ, a bush, an order of plants in the fragmenta methodi naturalis of Linnæus.
Duplica *radix*, a double root, a species of a bulbous root, consisting of two solid bulbs, as in some species of orchis.
Duplicato *ferratum folium*, sawed double, with lesser teeth within the greater.

Ebracteatus *racemus*, without a broctæa, or floral leaf.
Ecandata *corolla*, without a tail or spur, as in antirrhinum, cymbararia.
Echinatum *pericarpium*, pods beset with prickles like a hedge-hog.
Efflorescentia, the precise time when a plant shews its first flowers.
Emarginatum *folium*, when the apex of a leaf terminates in a notch; the same may be applied to petala, and stigma.
Enervium *folium*, leaves having no apparent nerves.
Enneandria, nine males, the ninth class in the sexual system.
Enneapesala *corolla*, flowers consisting of nine petals.
Enodis *caulis*, *culmis*, stalks and straws, having no knots or joints.
Enfatæ, plants, having sword-shaped leaves, an order of plants or joints in the fragmenta methodi naturalis of Linnæus.
Ensiforme *folium*, leaves shaped like a two-edged sword, tapering towards the point.
Equitantia *folia*, riding when the sides of the leaves approach in such a manner as the outer embrace the inner.
Erectus, *caulis*, *ramus folium*, upright, perpendicular.
Erosam *folium*, gnawed, when the leaf is sinuate, and the margin appears as if it were gnawed or bitten.
Exserta *stamina*, standing forth, when the stamina appear above the corolla.
Exstipulatus, without stipulæ.
Exsuccum *folium*, when the substance of the leaf is dry.
Extrafoliaceæ *stipulæ*, stipula, growing on the outside of the leaves

Farctum *folium*, stuffed, opposed to tubulosum.
Fasciculata *folia*, bundled, leaves growing in bunches.
Fascicularis *radix*, bundled, tuberous roots growing in bundles.
Fasciata *planta*, when many stalks grow together, like a faggot or bundle.
Fastigiati *pedunculi*, pedunculi pointed at the apex.
Fauces, the jaws or chops.
Femina *planta*, a plant bearing female flowers on the same root only.
Fibrosa *radix*, a fibrous root.
Filamentum, a thread applied to the thread-like part of the stamina.
Filices, ferns, one of the seven divisions of the vegetable kingdom, and an order of plants in the fragmenta methodi naturalis of Linnæus.

Filiform *filamentum*, thread-shaped stamina.
Fimbricata, *petala*, a fringed petal, as in menyanthus.
Fissum *folium*, a leaf split or cloven half way down.
Fistulosus *caulis*, a piped or hollow stem.
Flabellatum *folium*, a fan-shaped leaf.
Flaccidus *pedunculus*, the foot-stalk of a flower that is feeble and slender.
Flagellum, a twig, or shoot like a whip or thong.
Flexuosus *caulis*, a stalk having many turnings or bendings, taking a different direction at every joint.
Floralia *folia*, floral leaves that immediately attend the flower.
Floralis *gemma*, flower buds.
Flos, a flower.
Foliaceæ, *glandulæ*, glands growing on the leaves.
Foliaris *gemmatio*, leaf-buds.
Foliatia *plantæ*, the complication of the leaves, whilst folded within the gemma, or bud.
Foliatus *caulis*, a leafy stalk.
Foliifera *gemma*, a bud producing leaves.
Foliolum, a little leaf, one of the single leaves, which together constitute a compound leaf.
Foliosum *capitulum*, covered with leaves amongst the flowers or tops of the plant.
Folium, a leaf.
Fornicatum *petalum*, vaulted or arched, as in the upper lip of the flowers in the class didynamia.
Frebuens *planta*, plants growing frequently, or commonly every where.
Frondescentia, the season of the year when the leaves of plants are unfolded.
Frondosus *cordex*, a species of trunk composed of a branch and a leaf blendid together, as is frequently united with the fructification.
Fructescentio, the temporary part of a vegetable appropriated to generation, terminating the old vegetable, and beginning the new.
Frustranea *polygamia*, to no purpose, the third order of the class syngenesia.
Frutex, a shrub.
Fructicosus *caulis*, a shrubby stalk.
Fugacissima *petala*, petals that are fleeting, and of short duration.
Fulcratus *caulis*, branches having props, see *Fulcrum*.
Fulcrum, a prop or support.
Fungi, a kind of mushroom, one of the seven families of plants, an order of plants in the fragmenta methodi naturalis of Linnæus.
Furcata, forked.
Fusiform *radix*, a spindle-shaped root.

Galea, a helmet applied to the corolla of the class gynandria, as in orchis.
Galeatum *labium*, the lip of a flower, shaped like a helmet.
Gemnæ *stipulæ*, stipula growing in pairs.
Germinatus *pedunculus*, double foot-stalks growing from the same point.
Gemma, a bud, an hibernaculum on the ascending caudex.
Gemnatio, a young bud.
Gemmiparus, bearing buds.
Genera *plantarum*, genera of plants, the second subdivision in the Linnæan system; it comprehends an assemblage of species, similar in their parts of fructification, under the same class and order.
Geneculatus *caulis*, *culmus*, *pedunculus*, a jointed stalk, straw, or foot-stalk of a flower.
Germen, a sprout or bud, the base of the pistillum, the rudiment of the fruit yet in embryo.
Gibbum *folium*, bunching out, or gouty.
Glaber, smooth, having an even surface.
Gladiata *siliqua*, a sword shaped pod.
Glandulæ, a gland, or secretory vessel.
Glandulifera *scabrities*, a kind of bristly roughness on the surface of some plants, on which there are minute glands at the extremity of each bristle.

Glareosis *locis*, gravelly places, where plants delight in gravel.
Glaucophyllus, a blueish, or azure-coloured leaf.
Globoso *radix*, a round root.
Globularis *scabrities*, a species of glandular roughness, scarcely visible to the naked eye, the small grains of which are exactly globular.
Glochoides, the small points of the pubes of plants. Linnæus applies this term only to the hami triglochoids, with three hooked points.
Glomerata *spika*, flowers crowded together in a globular form.
Gluma, a husk, or chaff, species of calyx peculiar to corn and grasses.
Glutinositas, like glue or paste.
Gramina, grasses, one of the seven families of the vegetable kingdom.
Granulata *radix*, roots consisting of many little knobs, like seeds or grain, attached to one another by small strings, as in saxifraga granulata.
Gymnospermia, naked seeded, the first order of the class didynamia.
Gynandria, when the male and female parts are joined together, the twentieth class in the Linnæan system.

Habitualis *character*, the character or description of a plant, taken from its habit, which consists in the placentio, radificatio, ramificatio, foliatio, stipulatio, pubescentia, inflorescentia.
Habitus, the external appearance; Linnæus defines it, the conformity or affinity that the congeners of vegetables have to one another, in placentation, radification, &c.
Hamosa *seta*, hooked bristles.
Hastatum *folium*, leaves resembling the head of a spear or halberd.
Hemisphericus *calyx*, half round, or half a sphere.
Heptandria, seven miles, the seventh class of the sexual system.
Herba, an herb; according to Linnæus, it is the part of the vegetable which arises from the root; it is terminated by the fructification, and comprehends the stem, leaf, props, and hibernacula.
Herbaceæ *plantæ*, are perennial plants, which annually perish down to the root.
Herbaceous *caulis*, stalks that die annually.
Hermaphroditus *flos*, flowers that contain both sexes, as anthera and stigma.
Hesperidæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Hexagonus *caulis*, a stalk with six angles.
Hexandria, the sixth class in the sexual system, which produce hermaphrodite flowers, with six stamina of equal length.
Hexagynia; an order of plants that produce six styles.
Hexapetala *corolla*, flowers consisting of six petals.
Hexaphyllis *calyx*, a flower cup consisting of six leaves.
Hians *corolla*, a monopetalous flower that is gaping.
Hirsutus, rough, hairy.
Hispidus *caulis*, a stalk covered with strong fragile bristles.
Holeracea, pot herbs, an order of plants in the fragmenta methodi naturalis of Linnæus.
Horizontalis *flos*, flowers growing with their disk parallel to the horizon.
Hibernaculum winter-lodge, the part of a plant that incloses and secures the embryo from external injuries.
Hybrida, a bastard, a monstrous production of two plants of different species, like the mules in the animal creation.
Hypocrateriformis *corolla*, a monopetalous flower shaped like a cup or alver.

Icosandria, the twelfth class in the second system.
Imberbis *corolla*, a flower without a beard.
Imbricatus, tiled, when the scales of a stalk, or flower cup, lie over one another in the manner of tiles upon a house.
Immutatæ, unaltered.
Impar, odd, applied to a pinnated leaf, terminating in an odd lobe.
Inequalis *corolla*, an unequal flower.
Inanis *caulis*, hollow or empty stalks.
Incanum, *folium*, leaves covered with whitish down

Incisum *folium*, leaves cut into irregular segments.
Incompletus *flos*, imperfect flowers without petals.
Incrassatus *pedunculus*, foot-stalks of flowers that increase in thickness as they approach the flowers.
Incumbens *anthera*, anthera which are affixed to the filament sideways.
Incurvatus *caulis*, a stalk bowed towards the earth.
Inflatum *perianthium*, a calyx puffed out like a bladder.
Inflorescentia, inflorescence, signifies the various modes in which flowers are joined to the plant by the pedunculus.
Infundibuliformis *corolla*, a monopetalous flower shaped like a funnel.
Integerrimum *folium*, an entire leaf, whose margin is destitute of incisions or serratures.
Interfoliaceus *pedunculus*, flower-stalks arising from between opposite leaves.
Interruptum *folium pinnatum*, when the large folioles of a winged leaf are interrupted alternately by pairs of smaller ones.
Interrupta *spica*, a spike of flowers, interrupted or broken by small clusters of flowers between the larger ones.
Intrafoliaceæ *stipulæ*, stipulæ growing on the inside of the leaves of the plant.
Inundata *loca*, this term is applied by Linnæus to such places that are overflowed only in winter.
Involucrum, a cover, the calyx of the umbelliferous plants standing at a distance from the flower.
Involuta *folia*, rolled in leaves when their lateral margins are rolled spirally inward on both sides.
Irregularis *flos*, irregular flowers of deformed shapes.

Lacerum *folium*, a cleft or fissure, leaves whose margin is cut into segments, as if rent or torn.
Laciniatum *folium*, a leaf cut into irregular incisions.
Lactescentia, milky, those plants are called milky, whose juices are white, yellow, or red.
Lacunosum *folium*, leaves that are deeply furrowed, by the veins being sunk below the surface.
Legumen, pulse, a pericarpium of two valves, in which the seeds are fixed along one suture only.
Lenticularis *scabrities*, a species of glandular scabrities, in the form of lentils.
Ligulatus *flos*, when the petals, tubulated at the base, are plane linear towards the middle, and widest at the extremity, in form of a bandage.
Liliaceæ, like a lily, an order of plants in the fragmenta methodi naturalis of Linnæus.
Limbus, a border, the upper expanded part of a monopetalous flower.
Linea, a line, the second degree in the Linnæan scale for measuring plants, the twelfth part of an inch.
Lineare *folium*, leaves whose superficies are marked with parallel lines, running lengthways.
Lobatum *folium*, when leaves are divided to the middle into parts that stand wide from each other, and have their margins convex.
Locus *folium*, the particular part of the plant to which the leaf is affixed.
Lomentaceæ, bean meal, an order of plants in the fragmenta methodi naturalis of Linnæus.
Longum *perianthium*, when the tube of the calyx is equal in length to that of the corolla.
Lunatum *folium*, moon-shaped leaves, when they are round and hollowed at the base like a half moon.
Lunatum, shaped like a crescent.
Luridæ, pale, wan, an order of plants in the fragmenta methodi naturalis of Linnæus.

Marcescens *corolla*, flowers withering on the plant.
Margo *folii*, the margin or edge of the leaf.
Mas planta, male plants, see class *Dioecia*.

Masculus *flos*, male flowers, containing antheræ, but no stigma.
Membranaceum *folium*, when leaves have no distinguishable pulp between their surfaces.
Membranatus *caulis*, a stalk covered with thick membranes.
Monadelphia, one brother, the sixteenth class in the sexual system.
Monandria, one male, the first class in the sexual system.
Monocotyledones, a term in placentation, applied to plants whose seed have a single cotyledon.
Monoecia, one house, the twenty-first class in the sexual system.
Monogynia, one female, the first order of the thirteen classes in the Linnæan system.
Miliaris, *scabrities*, a species of glandular roughness appearing on the surface of some plants like grains of millet.
Monosperma, having one seed.
Mucronatum *folium*, a leaf terminating in a sharp point.
Multifidum *folium*, a leaf divided into many linear segments, or divisions.
Multiplicatus *flos*, a luxuriant flower, whose corolla is multiplied so as to exclude some of the stamina.
Multisiliquæ, many pods, an order of plants in the fragmenta methodi naturalis of Linnæus.
Muricatus *caulis*, a stalk, whose surface is covered with sharp points like the murex shell.
Muricatæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Musci, mosses, one of the seven families in the vegetable kingdom, and an order of plants in the fragmenta methodi naturalis of Linnæus.
Mutica *gluma*, when the arista is wanting.
Mutilatus *flos*, a mutilated flower.

Natans *folium*, a leaf which swims on the surface of water.
Navicularis *valvula*, when the valve of a seed vessel resembles a ship.
Necessaria *polygamiæ*, necessary marriages, the fourth order of the nineteenth class in the sexual system.
Nectarium, that part of the corolla that contains the honey juice.
Nervosum *folium*, leaves whose surface is full of nerves or strings.
Nidulantia *semina baccarum*, seeds nestling in the pulp of a berry.
Nitidum *folium*, a bright shining glossy leaf.
Nucamentaceæ, an order of plants in the fragmenta methodi naturalis of Linnæus.

Obcordatum *pentalum*, a heart-shaped petal, with its apex downwards.
Obliquum *folium*, when the apex of the leaf points obliquely towards the horizon.
Obsolete *lobatum folium*, leaves having lobes scarcely discernible.
Obtusum *folium*, leaves blunt or rounded at the apex.
Obvolutum *folium*, rolled against each other, when their respective margins alternately embrace the straight margin of the opposite leaf.
Operculum, a cover, as in the mosses.
Oppositi *rami folia*, branches and leaves that grow by pairs opposite each other.
Orbiculatum *folium*, round leaves.
Orchideæ *orchis*, an order of plants in the fragmenta methodi naturalis of Linnæus.
Ovatum *folium*, an oval, or egg-shaped leaf.

Pagina *folii*, the surface of a leaf.
Palea, chaff, a thin membrane rising from a common receptacle, which separates the flosculi.
Paleaceus *puppus*, chaffy down.
Palmata *radix*, a handed root, as in orchis.
Palmatum *folium*, a leaf shaped like an open hand.
Palustris, marshy or fenny.
Panduriforme *folium*, shaped like a guitar, a musical instrument so called.

Panicula, a panicle or loose spike of grass.
Papilionaeous, butterfly-shaped flower, as in the class diadelphia of Linnæus.
Papilionacæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Papilosum *folium*, a nipple, a leaf covered with dots or points like nipples.
Pappus, down.
Papulosum *folium*, a leaf whose surface is covered with pimples.
Parabolicum *folium*, a leaf in form of a parabola.
Parallelum *dissipimentum*, when the dissepiments are parallel to the sides of the pericarpium.
Parisitica *planta*, plants that grow only out of other plants, as the viscum.
Partiale *involucrum*, when at the base of the partial umbel.
Parvum *perianthium*, a little flower cup, or comparatively small, opposed to magnum.
Patens *caulis*, *ramus*, &c. spreading stalks and branches.
Pedatum *folium*, a species of compound leaf, whose divisions resemble the toes of a foot, as in helleborous fœtida.
Peduncularis *cirrhus*, a tendril proceeding from the foot-stalk of a flower.
Pedunculati *flores*, flowers growing on foot-stalks.
Pedenculus, the foot stalk of a flower.
Peltatum *folium*, when the foot-stalk is inserted into the disk of the leaf, and not into its base.
Penicilliformia *stigmata*, a stigma in form of a painter's pencil.
Pentagonus, *caulis*, a five-angled stalk.
Pentagynia, five males, the fifth order of a class.
Pentandria, five males, the fifth class in the sexual system of Linnæus.
Pentapetala *corolla*, a flower consisting of five petals.
Pentaphyllus *calyx*, a calyx consisting of five leaves.
Perennis *radix*, a perennial root, continuing for many years.
Perfectus *flos*, flowers having petals, the perfect flowers of Ray, Tournefort, and other botanists.
Perfoliatum *folium*, when the base of the leaf entirely surrounds the stem, or when the stalk grows through the centre of the leaf, as in crassula perfoliata.
Perforata *cotilydones*, to be pierced through a species of the monocotyledones exemplified in the germina; also an order of plants in the fragmenta methodi naturalis of Linnæus.
Perianthium, a kind of calyx, so called when contiguous to the fructification.
Pericarpium, a species of pod that contains the seed.
Perichætium, a modification in the receptaculum in the musci and algæ.
Perpendicularis, *radix*, a perpendicular, or downright root.
Personatæ, masked, an order of plants in the fragmenta methodi naturalis of Linnæus.
Pes, a foot.
Petaliformia *stigmata*, a stigma, resembling the shape of a petal.
Petalodes *flos*, a flower having petals.
Petalum, the corollaceous teguments of a flower.
Petioloris *cirrhus*, a tendril proceeding from the foot-stalk of a leaf.
Petiolatum *folium*, a leaf growing on a foot-stalk.
Petiolus, a little foot-stalk.
Pileus, a hat or bonnet, the orbicular expansion of a mushroom, which covers the fructification.
Pili, hairs.
Pinnatifidum *folium*, (a winged leaf) applied to simple leaves whose laciniæ are transverse to the rachiæ.
Piperitæ, pepper, an order of plants in the fragmenta methodi naturalis of Linnæus.
Pistillum, the style, or female organ of generation, whose office is to receive and secrete the farina fecundans.
Pixidatum *folium*, a kind of foliage, where one leaf is let into another by a joint, as in equisetum.

Piacentatio *cotyledons*, of the seed.
Planipetalus *flos*, a flower with plain flat petals.
Plumosus *pappus*, a kind of soft down.
Plumula, the ascending scaly part of the corculum.
Pollen, meal, the prolific powder contained in the antheræ.
Pollex, a thumb, the length of the first joint of the thumb, or a Parisian inch.
Polyadelphia, many brotherhoods, the eighteenth class in the sexual system.
Polyandria, many males, the thirteenth class in the sexual system of Linnæus.
Polycotylidones, many totyledons.
Polygamia, many marriages, the twenty-third class in the sexual system.
Polygynia, many females, an order of some of the classes in the sexual system.
Polypetala *corolla*, a flower consisting of many petals.
Polyphyllum *involucrum*, an involucrum of many leaves.
Polystachius *culmus*, a stalk of grass having many spikes.
Pomaceæ *pomum*, an apple, an order of plants in the fragmenta methodi naturalis of Linnæus.
Pomum, an apple.
Pori, pores.
Præmorsa *radix*, a bitten root, when it ends abruptly, as in scabiosa.
Preciæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Prismatius *calyx*, triangular flower-cup.
Procumbens *caulis*, lying on the ground.
Prolifer *flos*, flowers growing through, or out of one another, either from the centre or side.
Prominulum *dissipimentum*, to jet out beyond the valves.
Pronum *discum folii*, leaves having their face downwards.
Propago, a shoot, the seed of mosses.
Proprium *involucrum*, an involucrum when at the base of an umbellated flower.
Pseudo, a bastard.
Pubes, down or hair, one of the seven kinds of fulcra.
Polposum *folium*, a leaf having a pulpy or fleshy substance.
Pulveratum *folium*, a leaf powdered with a kind of dust like meal, as in primula farinosa.
Punctatum *folium*, a leaf sprinkled with hollow dots or points.
Putamineæ, like a shell, an order of plants in the fragmenta methodi naturalis of Linnæus.

Quadrangular *folium*, a quadrangular leaf, having four prominent angles in the circumspection of its disk.
Quadrisidum *folium*, a leaf divided into four parts.
Quadrijugum *folium*, a leaf having four pair of folioles.
Quadrilobum *folium*, a leaf consisting of four lobes.
Quadripartitum *folium*, a leaf consisting of four divisions down to the base.
Quaterna *folia*, when verticillate leaves come by fours, having four in each whorle.
Quina *folia*, verticillate leaves coming by fives.
Quinatum *folium*, when a digitate leaf has five folioles.
Quinquangulare *folium*, a leaf having five prominent angles in the circumscription of the disk.
Quinquejugum *folium*, when a pinnated leaf has five pair of folioles.
Quinquelobum *folium*, a leaf having five lobes.
Quinquefidum *folium*, a leaf consisting of five divisions, with linear senses, and straight margins.
Quinquepartium *folium*, consisting of five divisions down to the base.

Racemus, a bunch of grapes, or currants, or any other bunch of berries that bears that resemblance.
Rachis, the back bone, a species of receptaculum, as in the panicum.
Rachis, *folii* pinnati, the middle rib of a winged leaf, to which the folioles are affixed.

Radiatus *flos*, a species of compound flowers, in which the florets of the disk are tubular, and those of the radius ligulate, as in the class syngenesia.
Radicalia *folia*, leaves proceeding immediately from the root.
Radicans *caulis*, a stalk bending to the ground, and taking root where it touches the earth.
Radicatum *folium*, leaves shooting out roots.
Radicula, a little root.
Radius, a little root.
Radius, a ray, the ligulale margin of the disk of a compound flower.
Radix, a root.
Ramea *folia*, regards leaves that grow only on the branches, and not on the trunk.
Ramosissimus *caulis*, stalks abounding with branches irregularly disposed.
Ramus, a branch of a tree.
Ramosus *caulis*, a stalk having many branches.
Receptaculum, receptacle, the basis on which the parts of fructification are connected.
Reclinatum *folium*, a leaf reclined or bending downward.
Recurvatum *folium*, a leaf bent backwards.
Reflexus *ramus*, a branch bent back towards the trunk.
Regularis *corolla*, a flower whose parts are regular in its figure and magnitude.
Remotus *verticillus*, when the whorles of flowers and leaves stand at a distance from one another.
Reniforme *folium*, a kidney-shaped leaf.
Repandum *folium*, a leaf having a bending or waved margin, without any angles.
Rapens *radix*, a creeping root extending horizontally.
Repens *caulis*, a creeping stalk, either running along the ground, on trees or rocks, and striking roots at certain distances.
Reptans *flagellum*, creeping along the ground, as in fragaria.
Restantes *pedunculi*, foot-stalks remaining on, after the fructification has fallen off.
Resupinatio *florium*, when the upper lip of the flower faces the ground, and the lower lip is turned upwards.
Resupinatum *folium*, when the lower disk of the leaf looks upwards.
Retroflexus *ramus*, a branch bent in different directions.
Retrofractus *pedunculus*, bent backwards towards its insertion, as if it were broken.
Retusum *folium*, when the apex of the leaf is blunt.
Rhædes, the red poppy, an order of plants in the fragmenta methodi naturalis of Linnæus.
Rhombeum *folium*, a leaf whose shape nearly resembles a rhombus.
Rhomboideum *folium*, a leaf of a geometrical figure, whose sides and angles are unequal.
Rigidus *caulis folia*, stiff, hard, rigid.
Rimosus *caulis*, abounding with clefts and chinks.
Ringens, grinning and gaping.
Rosaceus *flos*, a flower whose petals are placed in a circle, in form like those of a rose.
Rostellum, a little beak, the descending plain part of the corculum of the seed.
Rotaceæ, a wheel, an order of plants in the fragmenta methodi naturalis of Linnæus.
Rotatus *limbus corolla*, a wheel-shaped flower, expanded horizontally, having a tubular basis.
Rotundatum *folium*, a roundish leaf.
Rubra *lactescentia*, red milkiness in plants.
Ruderata *loca*, rubbishy places.
Rugosum *folium*. a rough or wrinked leaf.

Sagittatum *folium*, an arrow-shaped leaf.

Sarmentaceæ, a twig or shoot of a vine, an order of plants in the fragmenta methodi naturalis of Linnæus.
Sarmentosus *caulis*, the shoot of a vine, naked between each joint, and producing leaves at the joints.
Scaber *caulis, et folium*, scabby and rough, having tubercles.
Scabridæ, rough, an order of plants in the fragmenta methodi naturalis of Linnæus.
Scabrities, a species of pubescens, composed of particles scarce visible to the naked eye, sprinkled on the surface of plants.
Scandens *caulis*, a climbing stalk.
Scapus, a species of stalk which elevates the fructification, and not the leaves, as in narcissus.
Scariosum *folium*, leaves dry on the margin that sound when touched.
Scitamina, fair, beautiful, an order of plants in the fragmenta methodi naturalis of Linnæus.
Scorpiodes *flos*, a flower resembling the tail of a scorpion.
Scutellum, a species of fructification which is orbicular, concave, and elevated in the margin, as in some species of lichen.
Scyphifer, cup-bearing, a subdivision of the genus lichen.
Secretoria *scabrities*, a species of glandular roughness on the surface of some plants.
Secunda *spica* a spike of grass with the flowers turned all towards one side.
Secusiformis *pubescentia*, a species of pubes on the surface of some plants, the bristles resembling an axe or hatchet.
Semen, seed.
Seminale *folium*, seed leaves.
Semiteres, *caulis*, half a cylinder, flat on one side, and round on the other.
Sempervirens *folium*, an ever-green leaf.
Sena *folia*, leaves growing in sixes, as in galium spurium.
Senticosæ, a briar, or bramble, an order of plants in the fragmenta methodi naturalis of Linnæus.
Sepiaria, a hedge, an order of plants in the fragmenta methodi naturalis of Linnæus.
Sericeum *folium*, a leaf whose surface is of a soft silky texture.
Serratum *folium*, a leaf growing immediately on the stem, without any foot-stalk.
Setæ, a bristle, a species of pubescens, covering the surface of some plants.
Setaceum *folium*, leaves shaped like bristles.
Sexus *plantatum*, plants are distinguished by the sex of their flowers, which are either male, female, or hermaphrodite.
Silicula, a little pod, a bivalve pericarpium.
Siliqua, a pod, a pericarpium consisting of two valves, in which the seeds are fixed alternately to each suture.
Siliquosa, the second order in the class tetradynamia.
Siliquosæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Simplex *caulis*, a simple, or single stem.
Simplicissimus *caulis*, the most simple stalk.
Sinnatum *folium*, a leaf whose sides are hollowed or scolloped.
Situs *foliorum*, the disposition of leaves on the stem and branches, which are either starry, by threes, opposite, alternate, scattered, or crowded.
Solidus *caulis*, a solid stalk or stump.
Solitarus *pedunculus*, when only one flower-stalk proceeds from the same part.
Solutæ *stipulæ*, loose, opposed to adnatæ.
Spadix, the receptaculum of a palm, a pedunculus which proceeds from a spatha.
Sparsi *rami*, *pedunculi folia*, scattered without order.
Spatha, resembling a sheath, an order of plants in the fragmenta methodi naturalis of Linnæus.
Spatulatum, *folium*, a leaf in form of spatula, an instrument used to spread salve.
Species *plantanum*, the third subdivision in the Linnæan system.
Spica, a spike, a species of inflorescence resembling an ear of corn.

Statuminatæ, a prop, an order of plants in the fragmenta methodi naturalis of Linnæus.
Stellata *planta*, one of Ray's classes, the tetrandria monogynia of Linnæus.
Stellatæ, an order of plants in the fragmenta methodi naturalis of Linnæus.
Stipulatus *papus*, a kind of trunk that elevates the down and connects it with the seed.
Stolo, a shoot, which, running on the surface of the ground, strikes root at every joint, as in fragaria and others.
Strobilus, a species of pericarpium, formed from an amentum.
Stylus, that part of the pistillum which elevates the stigma from the germen.
Submersum *folium*, when aquatic plants have their leaves sunk under the surface of the water.
Succulentæ, juicy, an order of plants in the fragmenta methodi naturalis of Linnæus.

Tessellatum *folium*, a chequered leaf, whose squares of different colours.
Tetragynia, four females, the fourth order of some of the classes in the sexual system.
Tomentosus *caulis folia*, a stalk and leaf covered with a whitish down like wool.
Torosum *pericarpium*, brawny protuberance, like the swelling of the veins when a pericarpium is bunched out by the inclosed seeds.
Trapeziforme *folium*, a leaf having four prominent angles whose sides are neither equal or opposite.
Triandria, three males, the third class in the sexual system.
Trisidum *folium*, a leaf divided into three linear segments, having straight margins.
Tripinatum *folium*, *compositum*, a leaf having a triple series of pinna, or wings.
Triplinerve *folium*, a leaf having three nerves running from the base to the apex.
Tuberosa *radix*, a tuberous or knobbed root.
Tunicatus *radix*, a species of bulbous root, having coats lying one over another from the centre to the surface, as in the onion, tulip, &c.
Turbinatum *pericarpium*, a kind of pod shaped like a top, narrow at the base and broad at the apex.
Turgidum *legumen*, swollen, puffed out, as in ononis.

Vaginales, sheathed, an order of plants in the fragmenta methodi naturalis of Linnæus.
Vaginans *folium*, a leaf like a sheath, whose base infolds the stem.
Venosum *folium*, the veins which run over the whole surface of a leaf.
Ventricosa *spica*, a spike narrowing at each extremity, and bellying out in the middle.
Vepreculæ, a briar, or bramble, an order of plants in the fragmenta methodi naturalis of Linnæus.
Verrucosa *capsula*, a capsule having little knobs, or warts, on its surface.
Verticalia *folia*, leaves so situated that their base is perpendicular above the apex
Vertillati *rami*, *flores*, *folia*, branches, flowers or leaves, or leaves surrounding the stem, like the rays of a wheel.
Verticillus, a species of inflorescence in which the flowers grow in whorles, as in mentha.
Viscularis *scabrities*, a kind of glandular roughness, resembling visiculæ.
Vexillum, a standard, the upright petal of a papilonaceous flower.
Virgatus *caulis*, stalks shooting out; slender straight branches, or rods.
Volva, the membranaceous calyx of the fungi.

Umbilicatum *folium*, a peltate leaf, shaped like a navel, at the insertion of the foot-stalk.
Undatum *folium*, a waved leaf, whose surface rises and falls in waves towards the margin.
Unguis, a nail or claw, that part of a petal that is joined to the receptacle.

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